

It is important that both carrier and crane operators avoid setting up or operating crane near electrical power lines. Be sure to observe all Local, State and Federal regulations regarding the safe minimum operating clearance to power lines.

Personnel should use care to keep from spilling fuel, coolant, or other liquids upon themselves. Exposed skin and body should not come into contact with metal during cold weather, as serious and painful injury may result.

Turn radiator cap slowly and allow pressure to escape before removing it.

Lower the attachment to the ground before attempting to adjust the boom hoist brake. Serious damage to the attachment or injury to personnel may otherwise result.

Disconnect battery cables before working on electrical components.

While in the park abort condition, the carrier will have no brakes. Always block the wheels so as to prevent crane motion before placing the machine in the park abort condition. Do not remove blocking until the carrier is returned to normal brake system operation.

Make sure proper program card is installed in the Safe-T-Lode computer.

WORKING OPERATION

It is important that both carrier and crane operators avoid setting up or operating crane near electrical power lines. Be sure to observe all Local, State and Federal regulations regarding the safe minimum operating clearance to power lines.

Use care when swinging the revolving frame without a boom, since it will tend to be unbalanced toward the counterweight end.

Do not rely on the ratchet brake locks on the front or rear drum brake pedals to suspend a load. The operator must remain in a position of readiness, with feet on pedals, at all times that a load is suspended.

The boom hoist pawl must be engaged at all times, except when lowering the boom. Do not attempt to engage the boom hoist pawl while lowering the boom.

Do not attempt to raise the boom by means of the boom hoist lines if the boom tip is below the ground level which supports the carrier. The angle of pull on the boom will be such that the boom may collapse before being pulled into the operating position.

WORKER OPERATION

The boom hoist pawl must be engaged at all times, except when lowering the boom.

Personnel should use care to keep from spilling fuel, coolant, or other liquids upon themselves. Exposed skin and body should not come into contact with metal during cold weather, as serious and painful injury may result.

Turn radiator cap slowly and allow pressure to escape before removing it.

The swing brake is not used to stop the revolving frame from swinging while the machine is in operation. It is used solely to prevent the revolving frame from turning while the machine is not in use, such as when it is moved from place to place.

Always inflate the tire from the side opposite the ring. If the ring is improperly installed, air pressure may cause it to fly off the wheel, and serious injury to personnel may result.

**OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL:
CRANE, WHEEL MOUNTED: 20-TON AT 10-FOOT RADIUS, 2 ENGINES,
DIESEL ENGINE DRIVEN, 4 X 4 AIR TRANSPORTABLE
HARNISCHFEGER CORP. MODEL M320RT
(NSN 3810-00-275-1167)**

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 202 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 (Test Report) located in the back of the manual and mail the form direct to Commander, US Army Tank-Automotive Command, ATTN: DRSTA-MSP, Warren, MI 48090. A reply will be furnished direct to you.

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ation, operation and preventive maintenance crane, carrier and accessories.

This manual is divided into two parts. Part One ins instructions for the crane (upper). Part Two ins to the carrier (lower). Both parts should be by maintenance personnel and operators prior rforming any service or operating the equip-

ppendix A provides a list of publications that so applicable to the equipment covered by this al. Appendix B is the maintenance allocation Appendix C is the basic issue items list and troop installed or authorized list.

Numbers in parentheses on illustrations indi- he quantity of each item required.

Forms and Records

forms and records used for equipment mainte-

This equipment is not covered by an ESC.

1-4. Destruction of Army Material and Administrative Storage

a. Refer to TM 750-244-3 for procedures des- truction of this equipment to prevent use by enemy.

b. Refer to TM 740-90-1 for administrative procedures.

1-5. Expendable Consumable Maintenance Supplies and Materials

Supplies and materials required for maint- support of the equipment covered here authorized to be requisitioned by CTA50-970. to table 1-1).

Table 1-1. Expendable Consumable Maintenance Supplies and Materials

| I S. | Description | Unit of meas | Qty anti |
|--|---|-----------------|-------------------------------------|
| D-243-1992 D-224-8730 D-243-1990 | Antifreeze, Ethylene Glycol, Inhibited O-A 548, Type 1 1 gal can 5 gal can 55 gal drum | ea ea ea | As requir As requir As requir |
| D-181-7929 D-181-7933 D-181-7940 | *Antifreeze, Ethylene Glycol, Inhibited; Heavy duty, Single Package, MIL-A-46153 1 gal can 5 gal can 55 gal drum | ea ea ea | As requir As requir As requir |
| D-174-1806 | NOTE This single package is replacing O-A 548 Type 1 above and will not require addition of corrosion inhibitor to the antifreeze solution. Antifreeze, Arctic Type MIL-A-11755 55 gal drum | ea | As requir |
| D-598-7328 D-169-1506 | Cleaning Compound w/Condi- tioner and Inhibitor for Engine Cooling Systems, MIL-C-10597 Package Test Kit, Reserve Alkalinity | ea ea ea | As requir As requir |

| | | | |
|------------------|---|-----|---------|
| | Oil, Fuel Diesel DF-2, Regular (VV-F-800) | | |
| 50-00-286-5295 | 5 gal can | gal | As requ |
| 50-00-286-5296 | 55 gal drum, 16 gage | gal | As requ |
| 50-00-286-5297 | 55 gal drum, 18 Gage | gal | As requ |
| 50-00-286-5291 | Bulk | gal | As requ |
| | Oil, Fuel, Diesel DF-1, Winter, (VV-F-800) | | |
| 50-00-286-5287 | 5 gal drum | gal | As requ |
| 50-00-286-5287 | 55 gal drum, 16 gage | gal | As requ |
| 50-00-286-5288 | 55 gal drum, 16 Gage | gal | As requ |
| 50-00-286-5289 | 55 gal drum, 18 Gage | gal | As requ |
| 50-00-286-5286 | Bulk | gal | As requ |
| | Oil, Fuel, Diesel, DF-A (Arctic) | | |
| 50-00-286-5282 | 5 gal drum | gal | As requ |
| 50-00-286-5284 | 55 gal drum, 18 Gage | gal | As requ |
| 50-00-286-5285 | 55 gal drum, 18 Gage | gal | As requ |
| 50-00-286-5283 | Bulk | gal | As requ |
| | Oil, Lubricating, Gear GO 80 (MIL-L-2105) | | |
| 150-00-905-9100 | 1 gal can | gal | As requ |
| 150-00-570-5841 | 5 gal drum | gal | As requ |
| 150-00-577-5842 | 55 gal drum, 16 gage | gal | As requ |
| 150-00-577-5843 | 55 gal drum, 18 gage | gal | As requ |
| | Oil, Lubricating, Gear GO 90 (MIL-L-2105) | | |
| 150-00-764-2636 | 1 qt can | qt | As requ |
| 150-00-577-5844 | 5 gal drum | gal | As requ |
| 150-00-577-5845 | 55 gal drum, 16 gage | gal | As requ |
| 150-00-577-5846 | 55 gal drum, 18 gage | gal | As requ |
| | Oil, Lubricating, Gear GOS (MIL-L-10324) | | |
| 150-00-261-7904 | 1 qt | qt | As requ |
| 150-00-2577-5440 | 5 gal drum | gal | As requ |
| 150-00-257-5443 | 55 gal drum, 18 gage | gal | As requ |
| | Oil, Lubricating, OE/HDO 10 (MIL-L-2104) | | |
| 150-00-265-9425 | 1 qt can | qt | As requ |
| 150-00-265-9428 | 5 gal drum | gal | As requ |
| 150-00-265-9429 | 55 gal drum, 16 gage | gal | As requ |
| 150-00-265-9430 | 55 gal drum, 18 gage | gal | As requ |
| 150-00-753-4763 | Bulk | gal | As requ |
| | Oil, Lubricating, OE/HDO 30 (MIL-L-2104) | | |
| 150-00-265-9433 | 1 qt can | qt | As requ |
| 150-00-265-9434 | 5 gal drum | gal | As requ |
| 150-00-265-9436 | 55 gal drum, 16 gage | gal | As requ |
| 150-00-265-9437 | 55 gal drum, 18 gage | gal | As requ |
| 150-00-753-4764 | Bulk | gal | As requ |

designed for operation in rough terrain. The crane is portable or can be transported by air by lifting the boom and upper portion of the crane and collapsing the gantry.

Carrier. The carrier is powered by a 8-cylinder Perkins Model V903, naturally aspirated diesel engine. It is capable of 2- or 4-wheel drive. The carrier steering system can provide: normal front wheel steering, 4-wheel track steering or 4-wheel "crab" steering. The carrier is equipped with four hydraulic jacks to be used for stabilizing the equipment during crane operations. The carrier is also equipped with a utility blade used basically for clearing a level site for crane operations.

Crane. The crane is powered by a 4-cylinder, Isuzu Diesel 4-53, Model 5043-7200 diesel engine. The crane is mounted on the rear of the carrier by means of a revolving frame. The crane is equipped with a 30-foot boom and a 20-ton block and tackle.

Identification Plates and Tabulated Data

Identification Plates. The carrier and crane has identification plates apart from the identification plates located in the operators cabs which are listed separately in the operating instruction chapters of this manual. The following subparagraphs list and identify the identification plates. Paragraph numbers coincide with the index numbers on figure 1-3 to show the location of each

NOTE

Some components, such as the transmission, clutch, engine governor, etc., may have manufacturer's data plates containing important information. Look for these plates when servicing or performing maintenance on those individual components.

(1) **Boom base data plate.** This plate supplies the make and manufacture date of the boom base section.

(2) **Designation plate.** Plate contains weight of boom base section.

supplies the NSN, make and manufacture date of boom upper section.

(5) **Boom support, warning plate.** Plate contains information on boom support during travel.

(6) **Attachments plate.** Plate contains information pertinent to lifting carrier by slings.

(7) **Transportation data.** Plate contains information on crane dimensions as required for transportation.

(8) **Carrier weight plate.** Plate gives the net weight of the carrier and the center of gravity.

(9) **Carrier lubrication plate.** Plate contains carrier lubrication information.

(10) **Hydraulic reservoir plate.** Plate contains important information for pressurizing system and checking oil level.

(11) **Crane identification plate.** Plate contains model and contract number, serial number, etc.

(12) **Crane weight data plate.** Plate contains weight and shipping information for the crane (upper).

(13) **Boom hoist reeving plate.** Plate contains instructions on reeving the boom hoist cable.

(14) **House lock plate.** Plate contains information on operation of the house lock.

(15) **Manufacturer data plate.** Plate shows manufacturer's trademark.

(16) **Rating plate.** Plate containing information on cranes lifting capacity.

(17) **Crane lubrication plate.** Plate contains lubrication information.

(18) **Information plate.** Plate contains weight of turntable, ring gear and roller circle.

(19) **US Army identification plate.** Plate contains make, model and serial number.

(20) **Fuel tank plate.** Plate contains fuel capacity and fuel type.

b. Tabulated Data.

(1) General.

| | |
|--------------------|---------------------|
| Manufacturer | Harnischfeger Corp. |
| Model | M320RT |
| Design | Rough terrain |

UPPER
SPREADER

BOOM BACKSTOPS

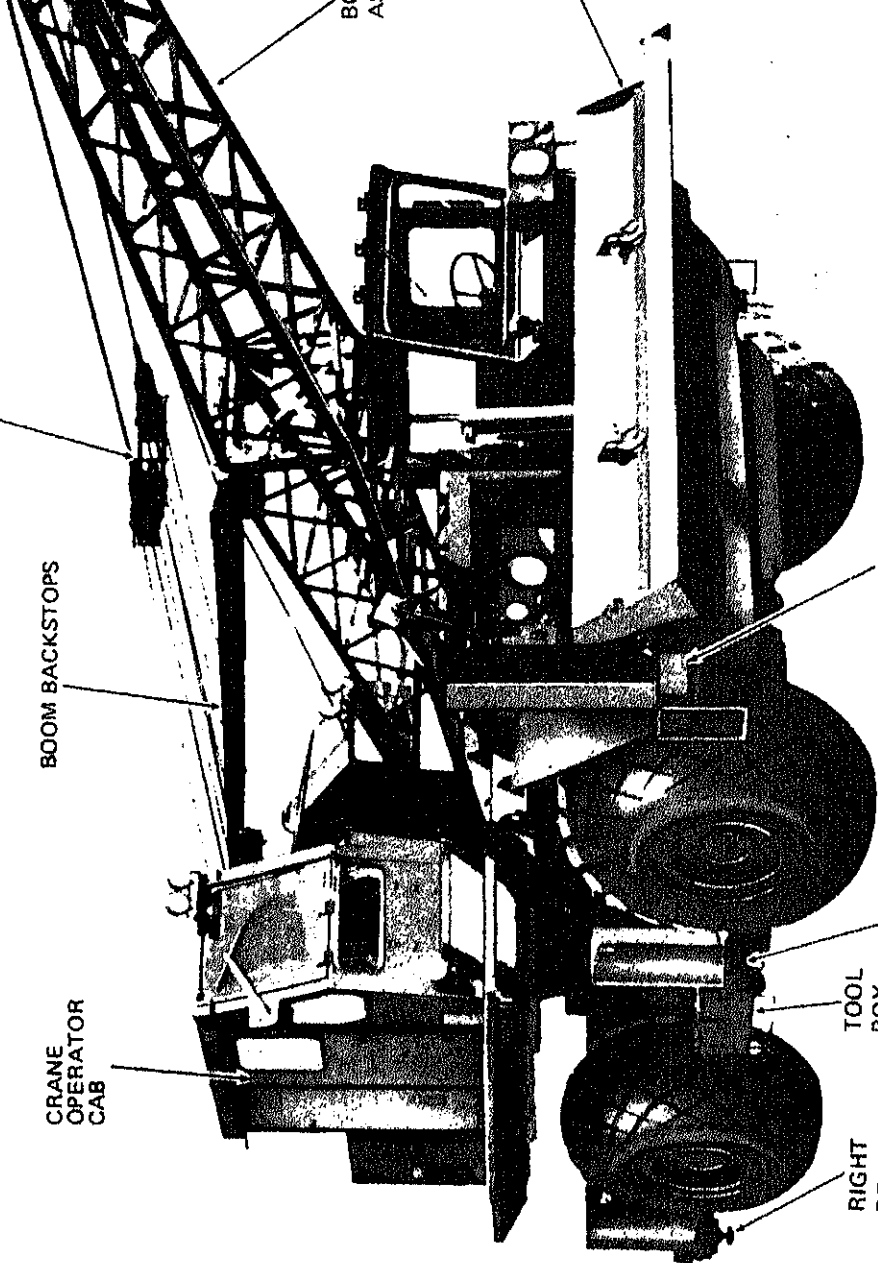
CRANE
OPERATOR
CAB

CARRIER
RADIATOR

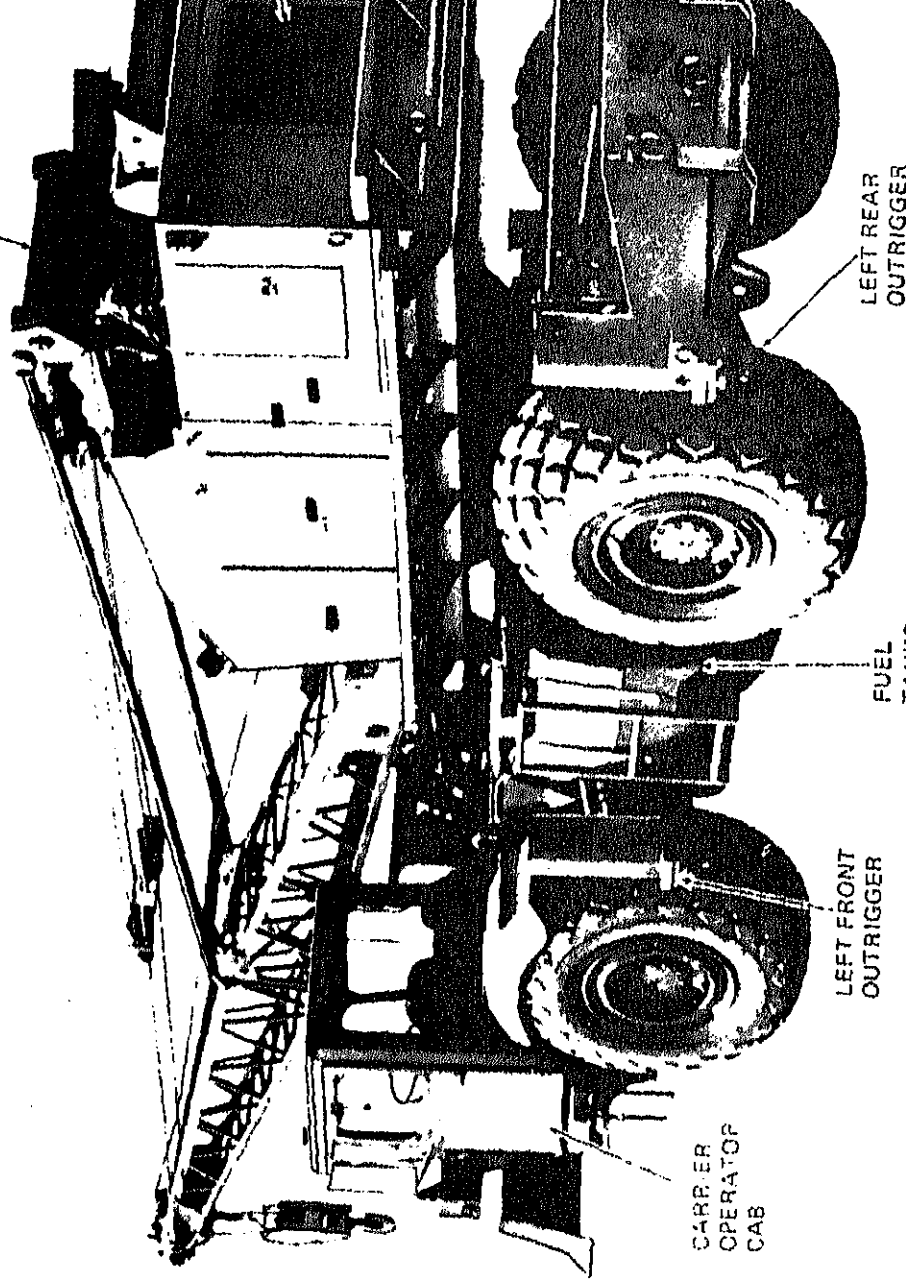
RIGHT
FRONT
OUTRIGGER

TOOL
BOX

RIGHT
REAR
OUTRIGGER



GANTRY



LEFT REAR
OUTRIGGER

FUEL
TANK

LEFT FRONT
OUTRIGGER

CARRIER
OPERATOR
CAB

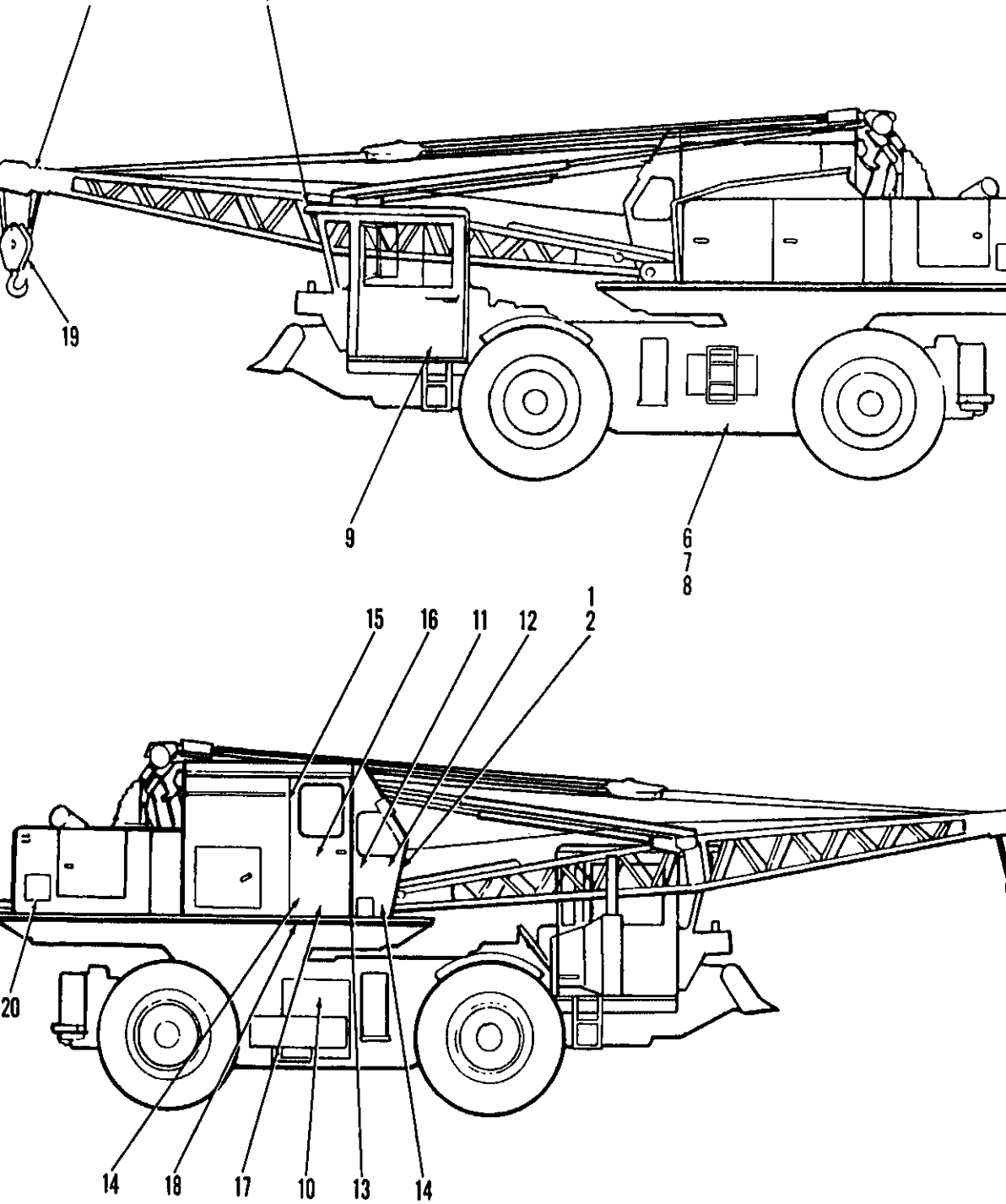


Figure 1-8. Data plates, loc. 11

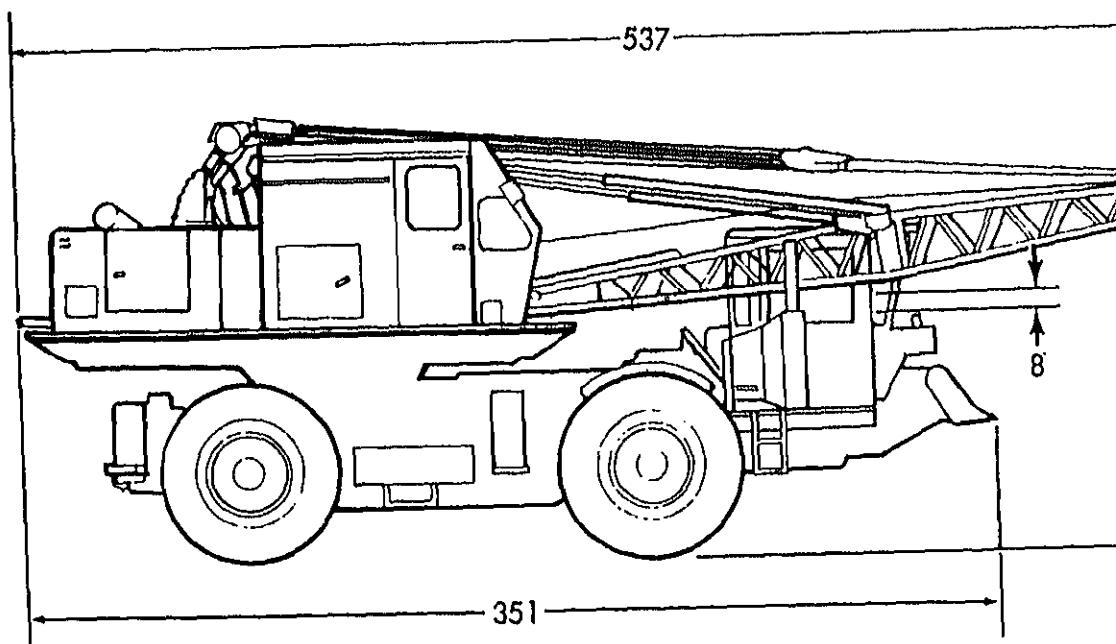
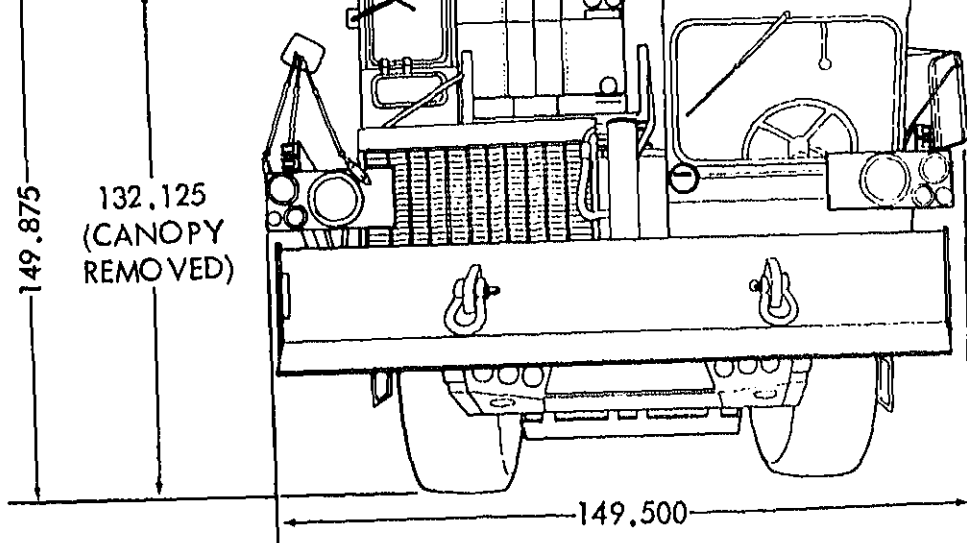


Figure 1-4. Shipping Dimensions.

(3) *Engine (carrier).*
 Manufacturer Cummins
 Model V903
 Type Diesel
 Bore 5.5 in.
 Stroke 4.75 in.
 Total displacement 903 cubic in.
 Governor speed 2600 rpm full load
 Horsepower 269
 Number of cylinders 8
 Compression 16.5:1
 Cooling Liquid
 Rotation at flywheel end Counterclockwise
 Firing order 1-5-4-8-6-3-7-2

(4) *Starting motor (carrier).*

Manufacturer Delco-Remy
 Part No. 1113925
 Volts 24

(5) *Battery charging alternator (carrier).*

Manufacturer Prestolite
 Part No. AMA-5102 UT

(6) *Regulator, alternator.*

(Part of alternator)

(7) *Air cleaner (carrier).*

Manufacturer Donaldson Co., Inc.
 Model FWG12-0077
 Type 2-stage dry type element

(8) *Lubrication oil filter (carrier).*

Manufacturer Cummins
 Part No. 218645
 Cartridge (3)

Manufacturer Fram
 Part No. CH33-PLM IL

(9) *Batteries (carrier).*

Type Dry charge (MS 35000-3)
 Volts 12

(10) *Capacities (carrier).*

Engine crankcase with
 oil filters 28 qts.
 Fuel tank 130 gals.
 Radiator 25 gals.
 Transmission and
 torque conv. 50 qts.
 Hydraulic system 230 qts.
 Front axle differential 18 qts.
 Rear axle differential 18 qts.
 Wheel planetaries (4) 12 qts. ea.
 Steering gear boxes (3) 1 qt. ea.

(11) *Engine (crane).*

Manufacturer Detroit Diesel Allison
 Model No. 5043-7200 (4-53)
 Type Diesel
 Number of cylinders 4
 Firing order 1-3-4-2
 Governor speed 2250 rpm full load
 Horsepower 97

Manufacturer Delco-Remy
 Model 40 M.T. series t
 Volts 24
 Part No. 1114717

(13) *Battery charging alternator (crane).*

Manufacturer Leeco-Neville
 Model A001-3002-AD
 Volts 24

(14) *Regulator, Alternator (crane).*

Manufacturer }
 Model }
 Volts }

(15) *Clutch (crane).*

Manufacturer Twin disc
 Model C-111
 Adjustment 1400 lb-in. on op

(16) *Air cleaner (crane).*

Manufacturer Donaldson
 Model FGA 12-7200
 Type Oil bath

(17) *Lubrication oil filter (crane).*

Manufacturer A.C. Div. GMC
 Part No. 51 3-1392
 Cartridge AC-PF-132

(18) *Batteries (crane).*

Type Dry charge (MS)
 Volts 12

(19) *Capacities (crane).*

Engine crankcase with filter ... 14 qts.
 Air cleaner 3¾ qts.
 Fuel tank 50 gals.
 Radiator 28½ qts.

(20) *Valve adjustment data.*

(a) *Carrier engine*

Intake valve
 Cold
 Hot

Exhaust valves
 Cold
 Hot

(b) *Crane engine*

Intake valves
 Cold
 Hot

Exhaust valves
 Cold
 Hot

(21) *Belt tensions.*

| Belt | Deflection |
|------------------------------------|------------|
| Carrier engine fan drive | |
| Carrier engine alt. and water pump | |
| Crane engine alternator | |
| Crane engine fan | |
| Crane engine water pump | |

(22) *Boom rating data. (See fig. 1-5.)*

P&H

MODEL M 320 RT-20 TON ROUGH TERRAIN CRANE

WARNING: READ FOR THE WIND EFFECT ON THE LIFTED LOAD

| RATED CRANE LOADS IN POUNDS - MAIN BOOM (28'W x 26'D) IN OVER SIDE AND REAR WORK AREAS WITH OUTRIGGERS SET | | | | | | | | | |
|--|-----------------|-------------|------------|-----------------|-------------|------------|-----------------|-------------|------------|
| OPER. RAD. FT. | 30 FT. BOOM | | | 40 FT. BOOM | | | 50 FT. BOOM | | |
| | BOOM PTCL. LBS. | RATING LBS. | ANGLE DEG. | BOOM PTCL. LBS. | RATING LBS. | ANGLE DEG. | BOOM PTCL. LBS. | RATING LBS. | ANGLE DEG. |
| 10 | 27.1 | 40000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 15 | 28 | 25000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 20 | 31 | 16000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 25 | 33 | 11000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 30 | 35 | 8000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 35 | 37 | 6000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 40 | 39 | 4000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 45 | 41 | 2000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 50 | 43 | 1000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 55 | 45 | 500 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 60 | 47 | 250 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |

WARNING

WHEN BOOM IS EQUIPPED WITH JIB

MAIN HOOK RATING MUST BE REDUCED 1000 LBS

TO COMPENSATE FOR JIB ATTACHMENT WEIGHT

| RATED CRANE LOADS IN POUNDS - MAIN BOOM (28'W x 26'D) IN OVER SIDE AND REAR WORK AREAS WITHOUT OUTRIGGERS SET | | | | | | | | | |
|---|-----------------|-------------|------------|-----------------|-------------|------------|-----------------|-------------|------------|
| OPER. RAD. FT. | 30 FT. BOOM | | | 40 FT. BOOM | | | 50 FT. BOOM | | |
| | BOOM PTCL. LBS. | RATING LBS. | ANGLE DEG. | BOOM PTCL. LBS. | RATING LBS. | ANGLE DEG. | BOOM PTCL. LBS. | RATING LBS. | ANGLE DEG. |
| 10 | 27.1 | 40000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 15 | 28 | 25000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 20 | 31 | 16000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 25 | 33 | 11000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 30 | 35 | 8000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 35 | 37 | 6000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 40 | 39 | 4000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 45 | 41 | 2000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 50 | 43 | 1000 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 55 | 45 | 500 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |
| 60 | 47 | 250 | | 24 | 46.7 | 24000 | 27 | 54.5 | 24000 |

RATINGS SHOWN DO NOT EXCEED

MAX. APPROVED TIRE CAPACITY

| MAIN HOIST DRUM RATED LOADS | | | |
|--|--------|--------|--------|
| NUMBER OF PARTS OF MAIN HOIST RATCHING | 1 | 2 | 3 |
| MAX. LOAD - LBS. | 10,000 | 20,000 | 30,000 |

Hamischfeger

P&H

710003 4100 0000 0000

WARNING: READ FOR THE WIND EFFECT ON THE LIFTED LOAD

OVER STRESS BOOM OR JIB STRUCTURE. WHEN MAIN LINE WITH BOOM DEGRADE CHART 25, ABOVE 30 M.P.H. AND TIE OFF. OR LOWER. WHEN OPERATING THIS UNIT "WITHOUT OUTRIGGERS AND SKING OVER SIDE" WILL INCREASE IN RADIUS. THE INCREASE IN RADIUS MUST BE COMPENSATED BY MACHINE MAY TIP OVER

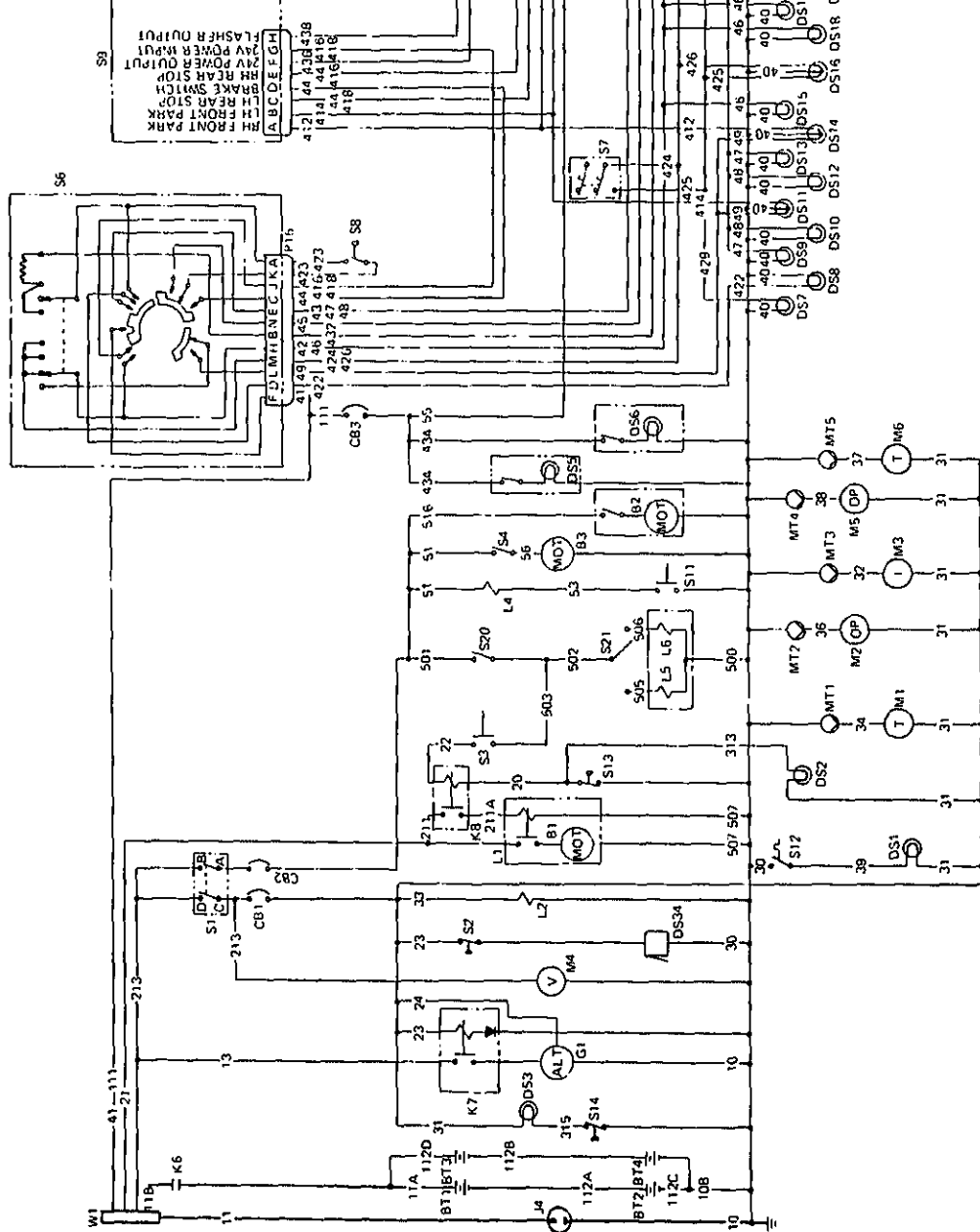
MACHINE STABILITY HAS BEEN TESTED PER

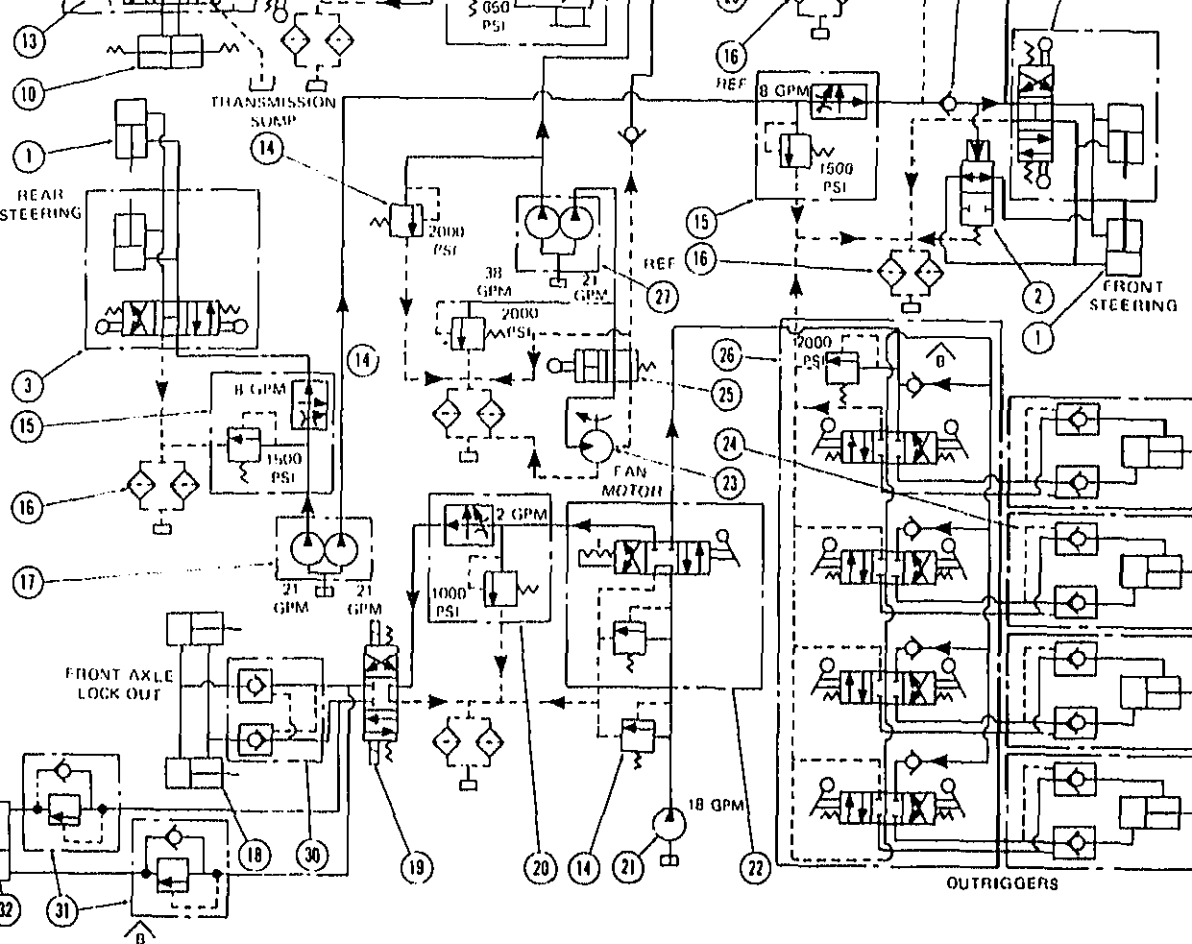
OPERATING RADIUS IS THE HORIZONTAL DISTANCE TO A VERTICAL LINE THROUGH THE

BOOM BACKSTOPS ARE REQUIRED FOR ALL BOOMS. 89% OF TIPPING LOAD AS DETERMINED BY SAE SUSPENDED LOADS AND MACHINE STANDING ON SURFACE. NO ALLOWANCE IS MADE FOR SUCH LOAD. GROUND CONDITIONS, OUT-OF-LEVEL, CONDITION THAT COULD BE DETRIMENTAL TO THE OPERATOR. THEREFORE HAS THE RESPONSIBILITY TO REDUCE LIFTED LOADS AND OPERATIONS. THE WEIGHT OF HOOK, BLOCK(S), SLINGS, AND LIES FROM MAIN BOOM OR JIB RATING SHOWN

MAXIMUM ANGLE JIB LONGITUDINAL AXIS TO HORIZONTAL CRANE RATING FOR THE 15 FOOT JIB AT ANY IS THE SAME AS RATING SHOWN IN TABLE FOR MAIN BOOM. BUT NOT TO EXCEED 7500 LBS. MAXIMUM EXCEED THE LENGTH OF MAIN BOOM ON WHICH IS RECOMMENDED WHEN BOOM IS EQUIPPED WITH

BOOM HOIST REEVEING IS 10 PART LINE. REFER 320466 FOR ADDITIONAL INFORMATION





(TA03)

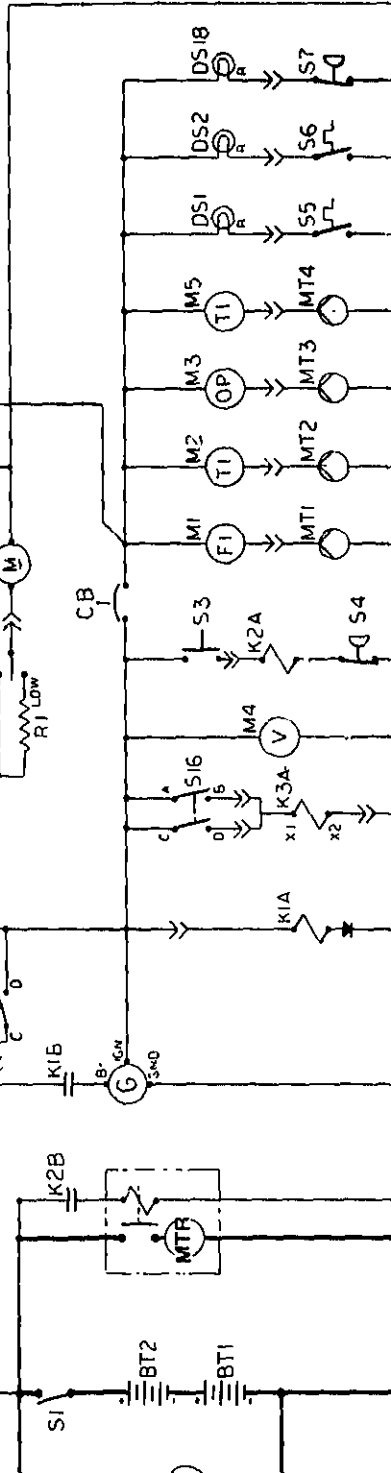
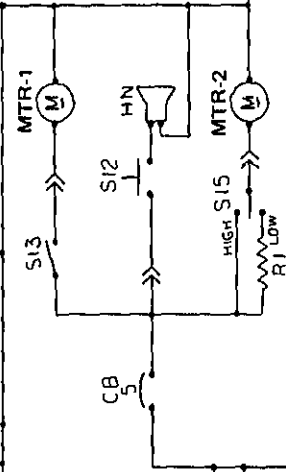
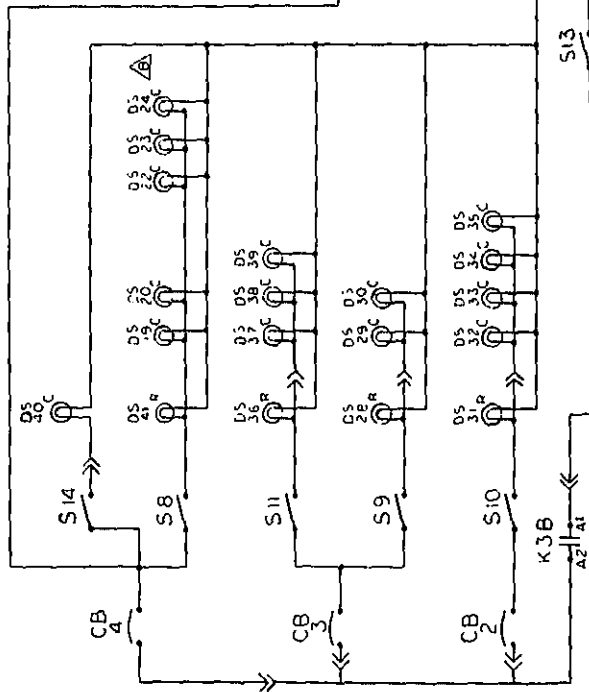
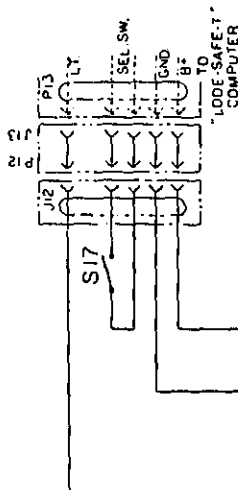
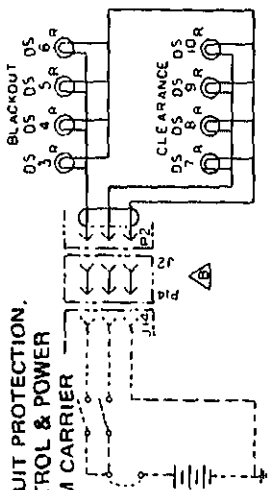
Hydraulic cylinder
Valve
Hydraulic cylinder
Check valve
Dozer control valve
Dozer cylinder
Check valve
Hydraulic pump
Steering control valve
Hydraulic cylinder
Check valve
Strainer filter

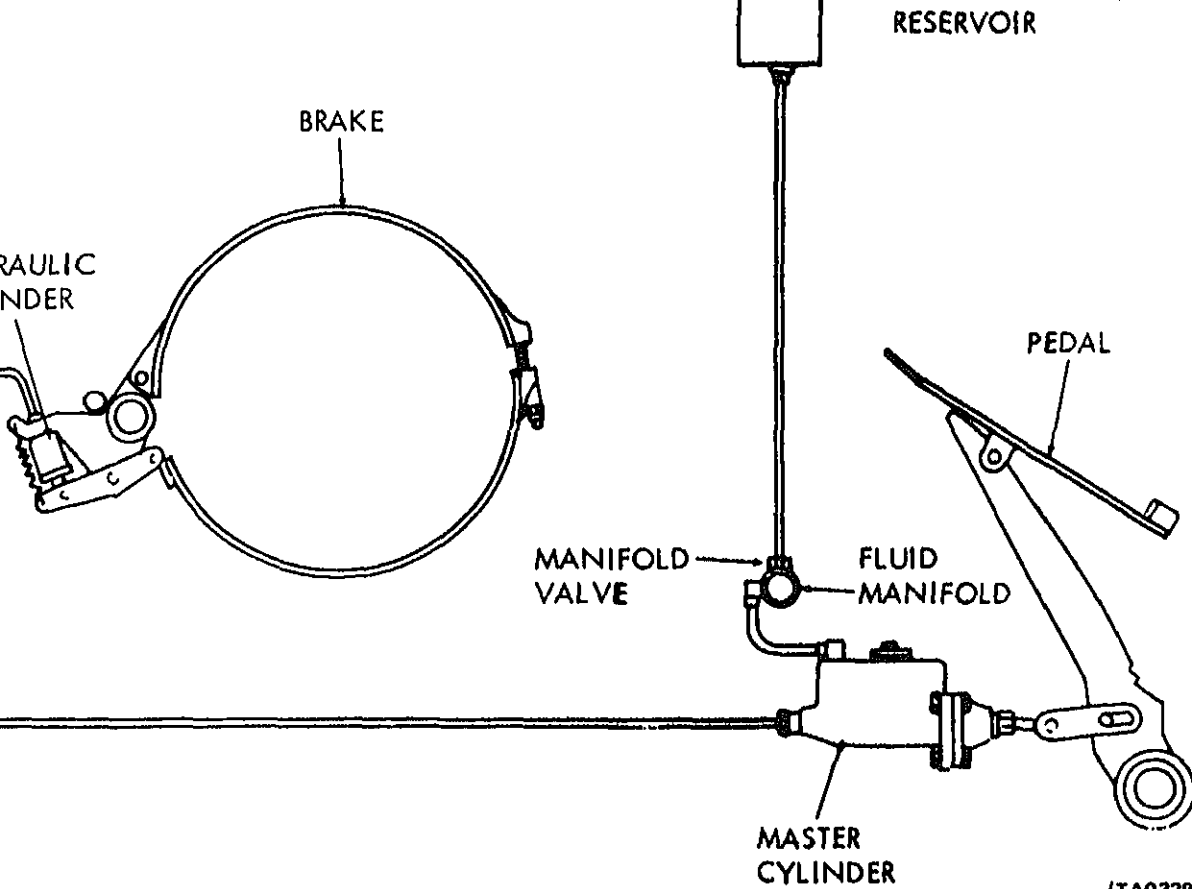
13 Hand and pilot operated
valve
14 Relief valve
15 Flow control and
relief valve
16 Hydraulic filter
17 Hydraulic pump,
dual outlet
18 Lockout cylinder
19 Double solenoid valve
20 Flow control and
relief valve

21 Hydraulic pump
22 Selector control valve
23 Hydraulic motor
24 Hydraulic cylinder
25 Control valve
26 Directional control valve
27 Hydraulic dual pump
28 Check valve, right angle
29 Flow divider valve
30 Double check valve
31 Relieve and check valve
32 Hydraulic cylinder

Figure 1-7. Carrier hydraulic diagram.

CIRCUIT PROTECTION, CONTROL & POWER FROM CARRIER





(TA0328)

Figure 1-9. Crane hydraulic diagram.

Section I. OPERATING PROCEDURES

WARNING

If the crane fails to operate after performing the service procedures contained in chapter 4, refer to the troubleshooting chart in chapter 3.

General

This section will describe the procedures required to operate the crane. Prior to attempting any operation of the crane, insure that the inspection and service procedures described in chapter 4 are performed. It is important that the operator familiarize himself with the controls and instruments described in paragraph 2-1 and the operating instructions contained in paragraphs 2-3 through 2-7.

WARNING

All operating and crew personnel shall familiarize themselves with and adhere to the safety precautions listed on the inside front cover of this manual.

Controls and Instruments

General. The crane operating controls and instruments are shown in figure 2-1 and the load limit safety device is shown in figure 2-3 (sheets 1 and 2). A description of all controls and instruments is given in subparagraphs 2-2b and 2-2c below.

Crane Controls and Instruments. The following paragraphs list and describe the controls and instruments located in the crane operator's cab. The paragraph numbers coincide with the index number in figure 2-1.

NOTE

The following information is intended for identification purposes only. See paragraph 2-3 for operating procedures.

(1) *Engine clutch lever.* Engages engine clutch when pushed backward. Pull forward to disengage engine clutch.

(2) *Program card select switch.* This switch, when moved in the appropriate position, signals the computer when the outriggers or tires are used.

increase engine speed. Pull back towards operator to decrease engine speed.

(6) *Radiator shutter control.* Pull lever to close shutters. Push lever in to open shutters. Push lever to lock in either position. The shutters are normally kept open during operation. They are closed when the engine is shutdown to protect the engine from snow, rain or sand from entering the engine compartment. During cold weather operations the shutters may be closed for easier starting and warm ups.

(7) *Crane lock lever.* Disengage crane lock by pushing forward on lever. To engage crane lock, push lever and let lock pin drop into lock hole. The crane boom must be lined up with boom lock to engage crane lock.

(8) *Rear drum pawl control.* Lift up and push handle backwards (towards operator) to engage rear drums safety pawl. Pull forward to release pawl and lock in release position by pushing handle forward.

CAUTION

If a load line is connected to the rear drum, the safety pawl must be engaged while suspending a load on that line. Do not attempt to engage the safety pawl while lowering a load.

(9) *Front drum pawl control.* Lift up and push this handle backward to engage front drum pawl in front drum ratchet. Drop lever into slot to lock in place.

CAUTION

The front drum pawl must be engaged while suspending a load. Do not attempt to engage this pawl while lowering a load.

(10) *Boom hoist drum pawl control.* Lift up and push this handle backward to engage the boom hoist drum pawl. Drop lever into slot to lock in place.

CAUTION

Make sure that the boom hoist drum pawl is engaged at all times except when lowering the boom. Never attempt to lower the boom with this pawl engaged.

(11) *Swing brake lock control.* Lift up and push handle backward to engage swing brake lock.

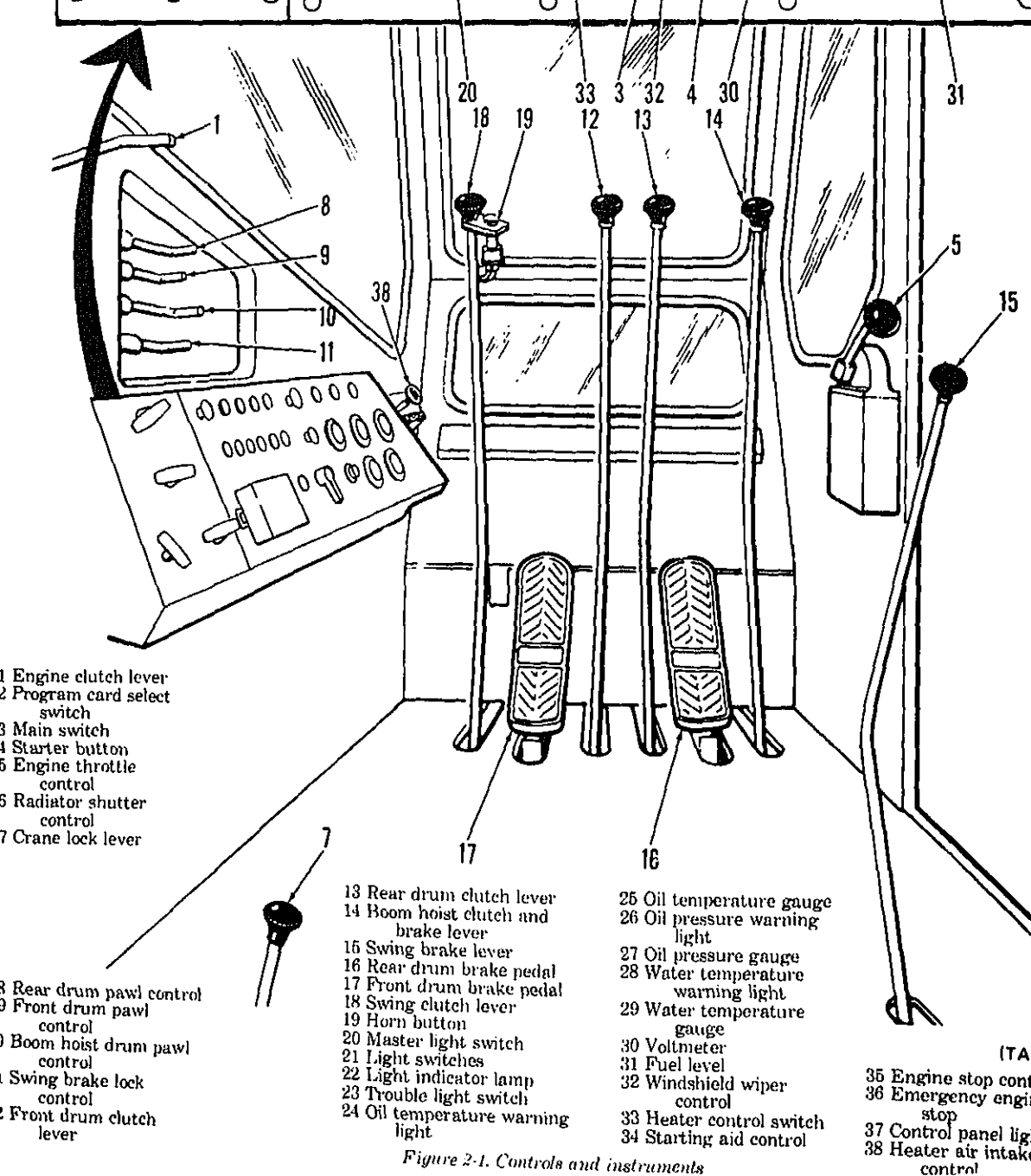


Figure 2-1. Controls and instruments

While these locks are engaged the operator must remain at the controls, in a position of readiness, at all times a load is being suspended. Set the appropriate drum safety pawls (8 or 9) if the load needs to be suspended more than momentarily.

(16) *Rear drum brake pedal.* Depress this pedal to apply the rear drum brake. Release pedal completely to release rear drum brake. To set the set lock on this brake, apply the brake and then the toe of the brake down while releasing pressure on the pedal. Depress the heel of the pedal to engage the ratchet lock.

(17) *Front drum brake pedal.* Depress this pedal completely to apply the front drum brake. Release to release drum brake. To set the ratchet lock on this brake, apply the brake and then hold the toe of the brake down while releasing pressure on the heel of the pedal. Depress the heel of the pedal to engage the ratchet lock.

(18) *Swing clutch lever.* Push this lever forward to swing the upper to the crane operator's left. Pull lever straight back to swing the upper to the

(19) *Horn button.* Depress this button to sound warning horn.

(20) *Master light switch.* Turn this switch on to illuminate any of the crane lights.

(21) *Light switches.* These are individual light switches to turn on/off the top or skirt floodlights, boom light and the panel lights.

(22) *Light indicator lamps.* These lamps, when illuminated, indicate which of the crane lights are turned on and are operating.

(23) *Trouble light switch.* Turn the toggle switch to supply electrical power to the troublelight, located behind operator's seat.

(24) *Oil temperature warning light.* This lamp illuminates when the oil exceeds normal operating temperature.

(25) *Oil temperature gauge.* This gauge indicates engine oil temperature in degrees Fahrenheit. Normal reading is 310-230.

tion of the battery and/or the voltage output of the crane alternator when the engine is running. See figure 2-2 for typical indications of this meter.

(31) *Fuel level gauge.* Indicate quantity of fuel in fuel tank.

(32) *Windshield wiper control.* Pull this knob to turn windshield wiper on. Push in to turn windshield wiper off.

(33) *Heater fan control switch.* Toggle switch to turn heater from off to low or high.

(34) *Starting aid control.* This control will activate the starting aid. See operating instructions contained in paragraph 2-3 before attempting to use this device.

(35) *Engine stop control.* Pull this handle to shut-down engine.

(36) *Emergency engine stop control.* Pull this handle in case of an emergency that requires engine to be shut-down. If this control is used, it must be reset at the engine prior to attempting to restart the engine (located at engine blower in engine compartment).

(37) *Control panel light.* This light is used to illuminate the operators control panel, during night time operations.

(38) *Heater air intake control.* Push this knob in for outside air and pull it out for inside heater air.

c. Load/moment Safety Computer. The following sub-paragraphs list and describe the control instruments of the Load/moment safety computer located in the crane cab. Operating instructions are given in paragraph 2-3. The following paragraph numbers coincide with the index numbers on figure 2-3.

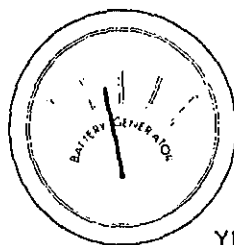
(1) *Computer console.* Located behind the operator's seat, this is the heart of the load moment safety device.

(2) *Computer card holder.* This compartment holds the appropriate computer cards for M320RT. For each boom length there is two cards, one for float operation and one for tire operation.

(3) *Low angle set button.* This button must be depressed while setting the low angle adjustment knob (4, fig. 2-3).

TERNATOR, IT SHOWS THAT GENERATOR IS NOT OPERATING OR VOLTAGE REGULATOR IS OUT OF ADJUSTMENT, OR THAT CURRENT BEING DRAWN FROM BATTERY BY LIGHTS, HEATER FAN, OR OTHER LOAD, EXCEEDS ALTERNATOR OUTPUT.

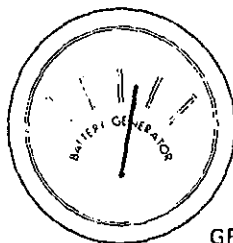
LOW BATTERY CHARGE. CONSTANT READING IN THIS AREA INDICATES FAULTY ALTERNATOR OR NEED FOR VOLTAGE REGULATOR ADJUSTMENT.



YELLOW AREA

WELL-CHARGED BATTERY. THIS INDICATES A GOOD BATTERY AND ALSO THAT GENERATOR AND VOLTAGE REGULATOR ARE OPERATING PROPERLY.

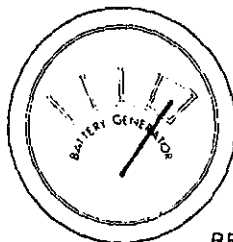
NOTE: THE POINTER MIGHT REMAIN IN THIS POSITION TEMPORARILY WHEN THE ENGINE HAS BEEN STOPPED AFTER CONSIDERABLE USE, DUE TO A "SURFACE CHARGE" IN THE BATTERY. TO GET A CORRECT READING, TURN ON HEADLIGHTS FOR A FEW MINUTES.



GREEN AREA

INDICATES ALTERNATOR, VOLTAGE REGULATOR AND BATTERY ARE ALL IN GOOD CONDITION AND WORKING PROPERLY.

INDICATES FAULTY METER WHEN ENGINE IS STOPPED.



RED AREA

INDICATES VOLTAGE REGULATOR IS SET TOO HIGH OR IS JAMMED AND CONTINUED OPERATION WILL BURN OUT BATTERIES.

Figure 2-2. Voltmeter indications.

- (9) *Fuse holder*. Holds in line fuses. Turn cap to remove fuse and to the right to lock in fuses.
- (10) *Remote indicator*. This unit is located in front of the crane operator on the left hand side of the crane windshield. A cover is provided for shut-down periods and shipping purposes. Mounted on the unit are the warning lights, percent capacity meter and the boom angle meter (11-17, fig. 2-3).
- (11) *Percent capacity meter*. This meter indicates the percent lifting capacity the crane has at any boom angle.
- (12) *Normal indicator light*. This light (green) remains lit as long as the load being lifted is in a "NORMAL" safe range.
- (13) *Caution indicator light*. This light (yellow) lights up when the load being lifted reaches 90 percent of the cranes lifting capacity.
- (14) *Warning indicator light*. This light (red) will light up when the load being lifted is 100 percent of the cranes lifting capacity. In addition to this visual warning, an alarm bell, located in the crane cab, will sound.
- (15) *Boom angle meter*. This meter indicates the boom angle at all times during operation.
- (16) *Tires light*. This light will illuminate when the boom (2, fig. 2-1) is placed in the tires position.
- (17) *Float light*. This light illuminates when the boom (2, fig. 2-1) is placed in the float position.
- (18) *Remote indicator panel light*. This light is used to illuminate the remote indicator panel (10, fig. 2-3) during night time operations. The bright/ dim toggle switch is located on top of the light.

Operation

General. The Model M320RT truck crane with boom installed and properly reeved is capable of lifting placement of a load at an elevation above or below ground level. As issued, the M320RT is capable of crane boom operations only. If this unit is modified for piledriving, backhoe, clamshell or drag-

7-3(i).

- (5) Check the work site for obstructions or conditions that will interfere with the safe operation of the crane. Especially be aware of any overhead power lines that are within the operating range of the crane boom.

2-4. Starting Crane Engine

- a. Open the rain shutters by pushing the rain shutter control in (6, fig. 2-1).
- b. Refer to figure 2-4 and start the crane engine.

2-5. Load/moment Safety Computer

- a. **General.** The load/moment safety computer is a device designed to provide the operator with boom angle and percent of load capacity at all times. It also provides a warning light and bell to warn the operator when the boom angle and/or the load being lifted exceeds the crane's rated capacity or safety limits.

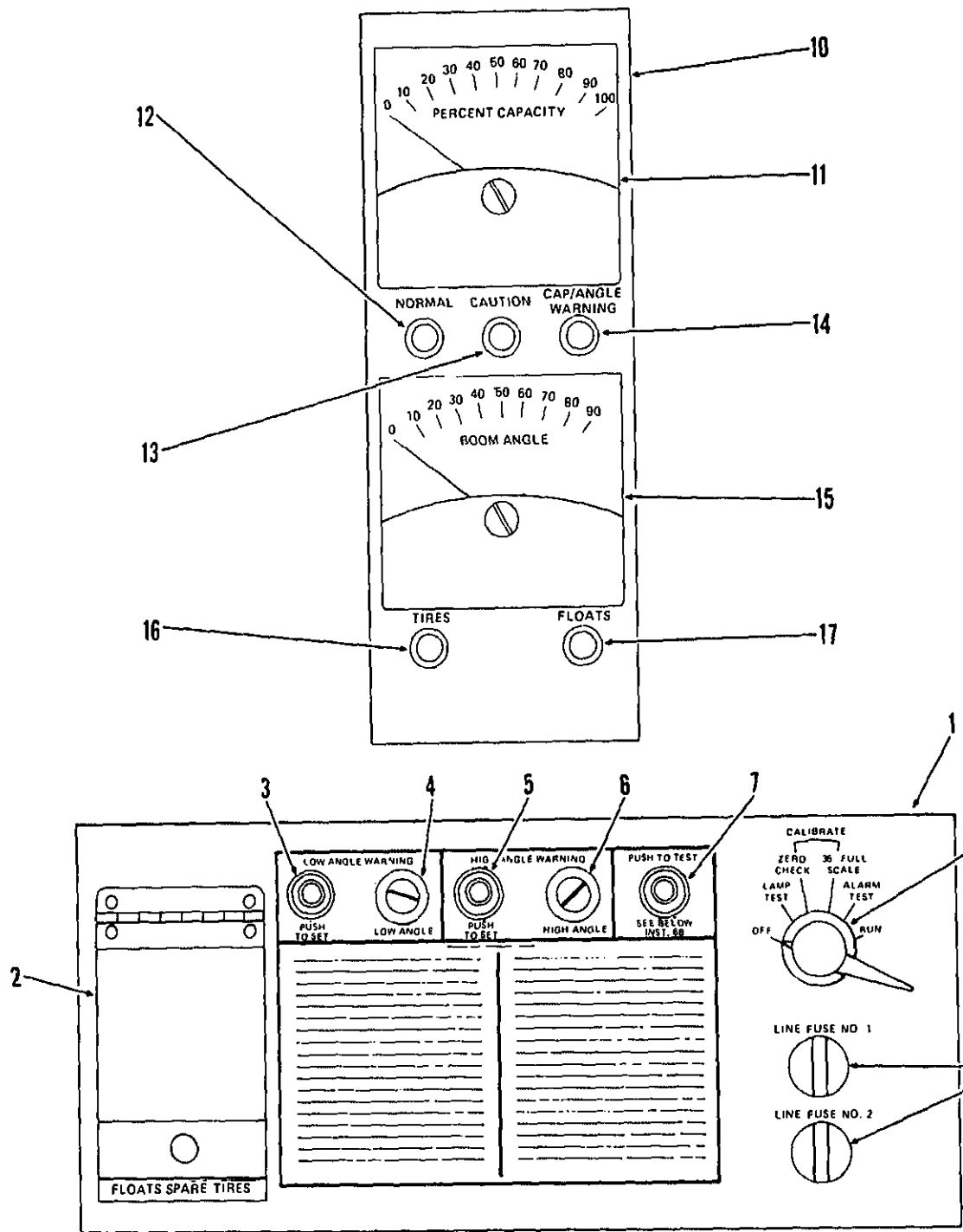
WARNING

When the warning light shines and/or the warning bell sounds, cease operation immediately and check for cause. Do not continue operations until cause of warning has been determined and corrective steps taken.

- b. **Card Installation.** Install proper card for boom length being used. Determine proper card to install as illustrated in figure 2-5.

- c. **Test.** The following test shall be completed before a load is lifted or any work operation started. If during the test, any of the required conditions do not exist, shut down the computer, crane engine and report the condition to direct general support maintenance personnel. Test as follows:

- (1) Place program card select switch (2, fig. 2-1) to floats or tires position.



1 Computer console

9 Fuse holder

14 Cap/angle warning indicator

STEP 1. PUSH ENGINE CLUTCH LEVER FORWARD TO DISENGAGE CLUTCH.

STEP 2. ADVANCE HAND THROTTLE LEVER HALFWAY.

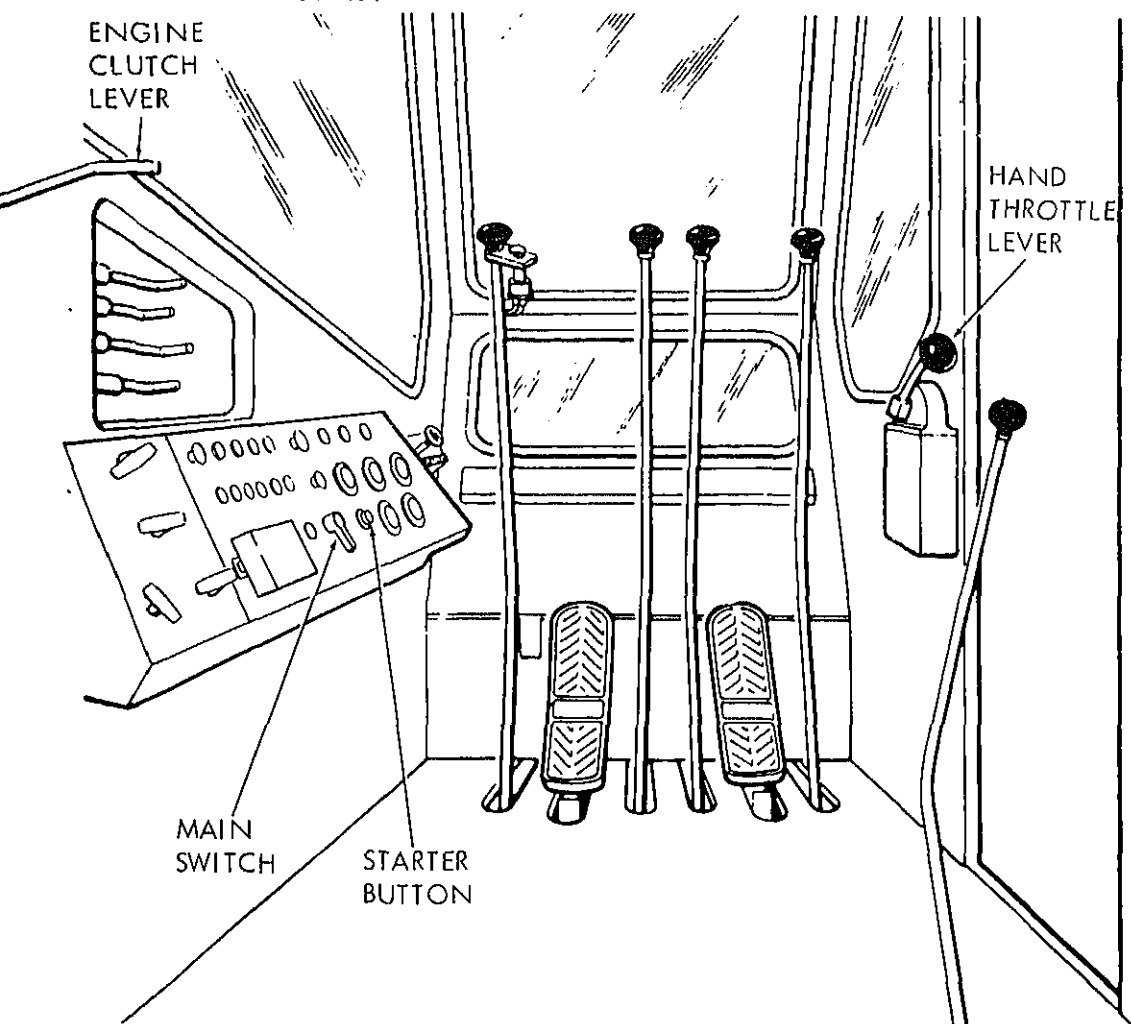
STEP 3. TURN MAIN SWITCH ON.

STEP 4. DEPRESS STARTER BUTTON. RELEASE WHEN ENGINE STARTS.

CAUTION: DO NOT CRANK ENGINE FOR MORE THAN 30 SECONDS CONTINUOUSLY WITHOUT ALLOWING A 2-MINUTE COOLING PERIOD. IF ENGINE DOES NOT START AFTER A FEW TRIES, STOP CRANKING. DETERMINE CAUSE AND CORRECT OR REPORT CONDITION TO ORGANIZATIONAL MAINTENANCE.

STEP 5. THROTTLE ENGINE TO FAST IDLE (APPROX. 1,500 RPMs) UNTIL TEMPERATURE GAUGE REACHES NORMAL.

STEP 6. CHECK FOR WARNING LIGHT OR ABNORMAL GAUGE INDICATIONS. LISTEN FOR ABNORMAL NOISES.



P&H LODE-SAFE-T[®] COMPUTER

THE PROGRAM CARD MUST MATCH THE MACHINE CONFIGURATION
THE PROGRAM CARD IS CODED AS FOLLOWS:

| BOOM LENGTH (FEET) | JIB LENGTH (FEET) | JIB ANGLE (DEGREES) | LETTER | LETTER | LETTER |
|-----------------------|------------------------|------------------------|--------|--------|--------|
| MACHINE | "O" -- OUTRIGGER | | | | |
| SUPPORT | "T" -- TIRES | | | | |
| PLAN | "F" -- FLOATS, MALKIEL | | | | |
| | "B" -- BEAM, FLOAT | | | | |
| | "C" -- CRAWLER | | | | |
| RATING PLATE | "M" -- MAST | | | | |
| | "S" -- SPECIAL | | | | |
| WORK AREA* | "R" -- REAR | | | | |
| | "F" -- FRONT | | | | |

*BOOM POSITION IS ONLY SPECIFIED IF NOT THE LEAST STABLE POSITION
EXAMPLE OF A TYPICAL PROGRAM:

CODE: 300-080-30 OMH. THIS IS A 300' BOOM WITH 80 FT JIB AT 30° ANGLE USED ON
OUTRIGGERS WITH MAST AND OVER THE REAR ONLY.

3221318

CARD CODE PLATE

(TAD)

Figure 2-5. Computer card code and installation.

(2) Turn selector switch (8, fig. 2-3) to lamp test position and check for the following conditions:

- (a) The orange CAUTION light (13) is on.
- (b) The red WARNING light (14) is on.
- (c) The percent capacity meter (11) should read 100 percent - plus.
- (d) The tires or floats light (16 or 17) should be on depending on selector switch position.

NOTE

Bell may sound if boom is below 0°.

(3) Turn the selector switch to CALIBRATE-ZERO CHECK position. If no internal error in the computer exists, the percent capacity meter should read zero \pm 1.5%.

(4) Turn the selector switch to CALIBRATE-35° FULL SCALE position. Place program card select switch to float position. Operate the boom as described in figure 2-5 and raise the boom to an angle of 35°. Lower the hook block to the ground. The percent capacity meter should read 100%.

check the computer. Due to variations in boom weight, reeving, manufacturing tolerances etc. a small amount of meter variation (\pm 10%) is possible.

(5) Turn the selector switch to the ALARM TEST position. In this position, the same conditions as step 2 shall exist plus the alarm bell should sound.

(6) Upon satisfactory completion of above steps, turn selector switch to RUN position.

NOTE

If boom is below safe operating range, the alarm bell will ring.

d. *Angle Warning Set-up.* Under some operating conditions it may be desirable that operators be warned of obstruction above and below the boom such as overhead wires, buildings, fences etc. Limiting angles can be pre-set into the computer as follows:

- (1) Unhook low angle locking ring on boom.

- (3) Lock low angle adjuster hub locking ring.
- (4) Test the unit by depressing the test button and the low angle set button (3) at the same time. Alarm bell should sound when these buttons are depressed. Report the condition to direct and central support maintenance personnel if the bell does not sound.
- (5) Repeat steps (1), (2) and (3) for the HIGH angle set button (5) and HIGH angle adjustment (6).
- (6) The angle warning is now set-up and when angle settings are exceeded the warning light will flash and the alarm bell will sound.

Crane Operation

Perform the preoperational services described in paragraph 2-3b.

Start the crane engine as described in paragraph 2-4.

Test and set up the load/moment safety computer as detailed in paragraph 2-5.

Start the crane engine as described in paragraph 2-4.

Test and set up the load/moment safety computer as detailed in paragraph 2-5.

Prior to starting work operations refer to figures 2-6 thru 2-11 and become thoroughly familiar with all crane operating procedures. Make sure that

(2) Check the drum brakes, one at a time, by applying the brakes and then, very slightly, releasing the drum clutch. The clutch will pull against the set brakes and any slippage will be felt and heard. Refer to paragraph 3-25 and adjust brakes if necessary.

(3) If possible lift a maximum load a few inches off the ground and watch the load to see if it settles down. Adjust drum brake as described in paragraph 3-25, if necessary.

(4) Release each brake drum one at a time and engage the corresponding clutch checking for smooth and responsive action.

(5) Carefully feel drum and clutch housings for overheating. Unnecessary excessive use of brakes or clutches will cause overheating and damage. Worn drums and linings will result. Report drum or clutch damage to organizational maintenance personnel.

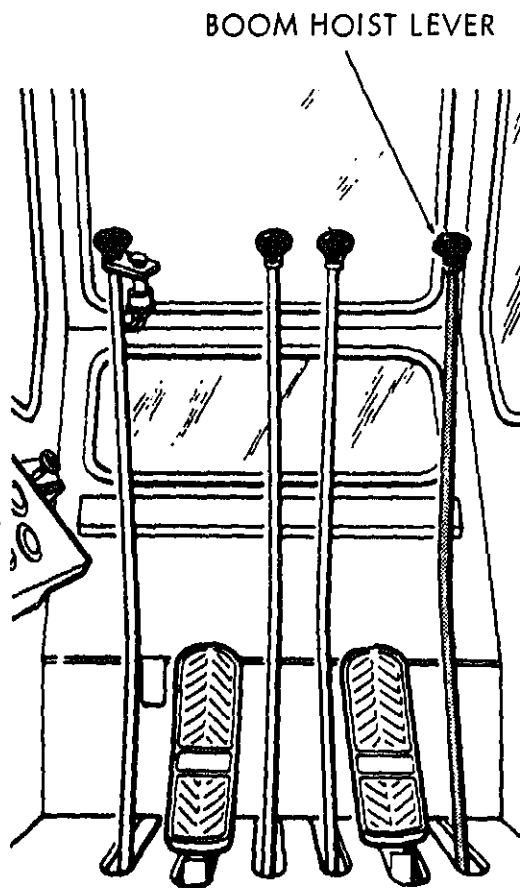
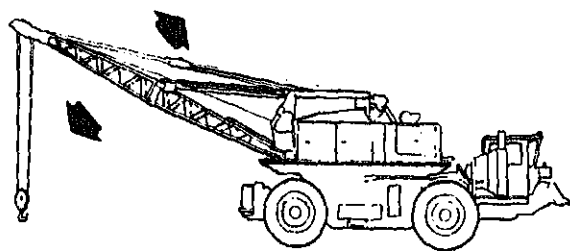
e. Operate the crane as follows:

- (1) Set boom angle as shown on figure 2-6.
- (2) Lift load as shown on figure 2-7.
- (3) Swing crane as shown on figure 2-8.
- (4) Spot load as shown on figure 2-9.
- (5) Lower load as shown on figure 2-10.

2-7. Crane Shutdown

- a. Lower load and/or hook block to the ground.
- b. Set the swing brake.

1. DETERMINE PROPER BOOM ANGLE FOR LOAD AND WORKING CONDIT
2. PULL BOOM HOIST LEVER TO RAISE BOOM OR PUSH LEVER FORWARD TO BOOM UNTIL THE DESIRED ANGLE IS INDICATED BY THE BOOM ANGLE CATOR (LOCATED ON RIGHT HAND SIDE OF BOOM BASE).
3. MOVE LEVER TO THE NEUTRAL POSITION AND BOOM HOIST BRAKE WILL BOOM.



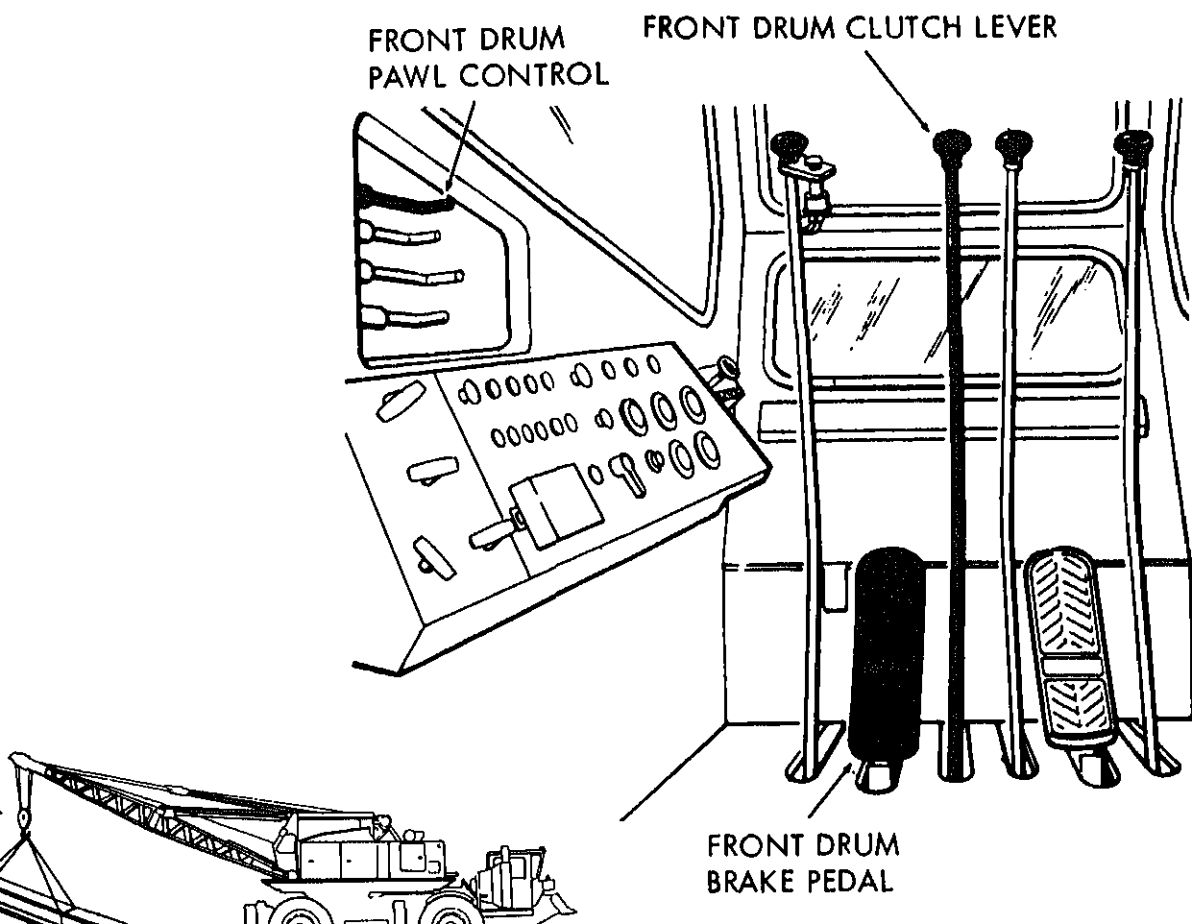
LIFTING STRAPS.

PULL BACK ON FRONT DRUM CLUTCH LEVER WHILE SIMULTANEOUSLY RELIFTING STRAPS.

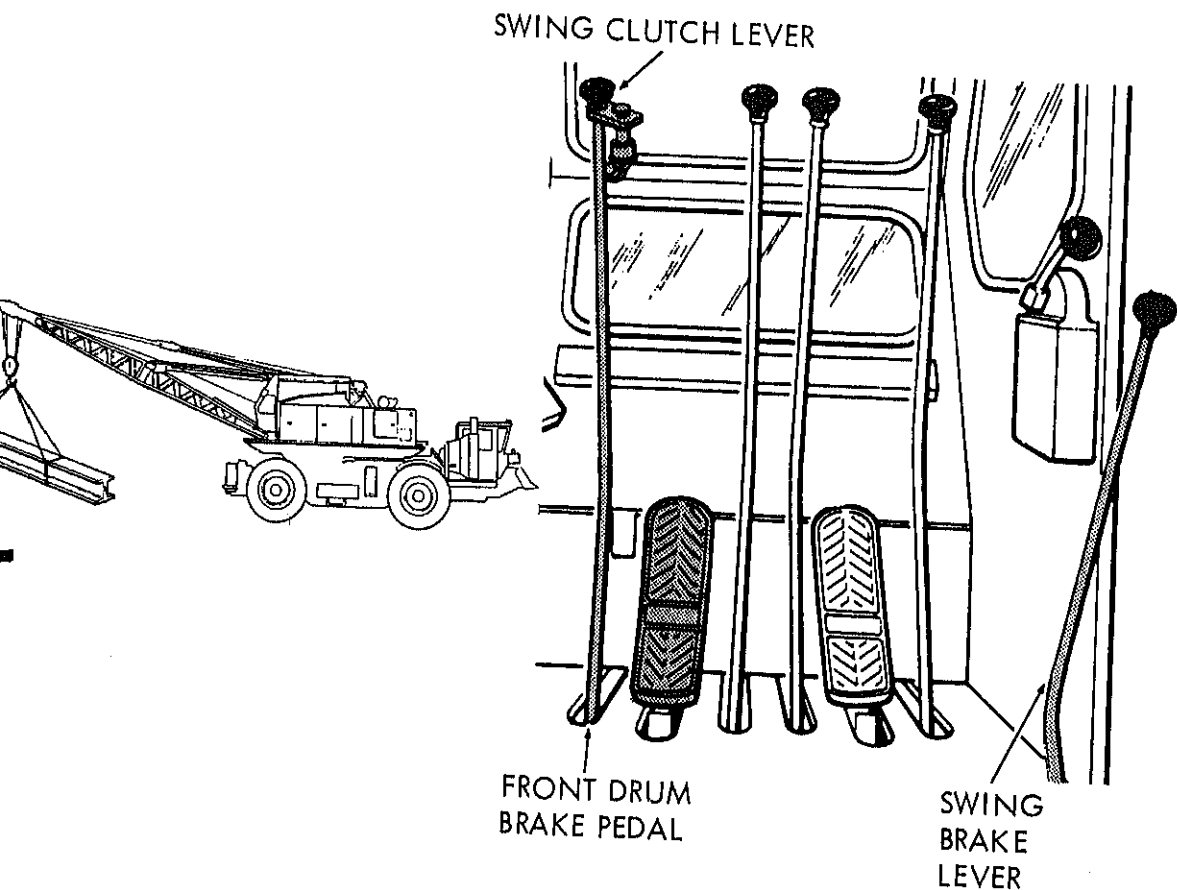
HOIST TO DESIRED HEIGHT, APPLY BRAKE AND MOVE LEVER SIMULTANEOUSLY TO NEUTRAL.

SET DRUM PAWL TO PREVENT LOAD FROM FALLING IF LOAD IS TO REMAIN SUSPENDED.

THIS PROCEDURE SHOULD BE USED WITH THE REAR DRUM CLUTCH LEVER AND BRAKE PEDAL IF THE LOAD LINE IS CONNECTED TO REAR DRUM.



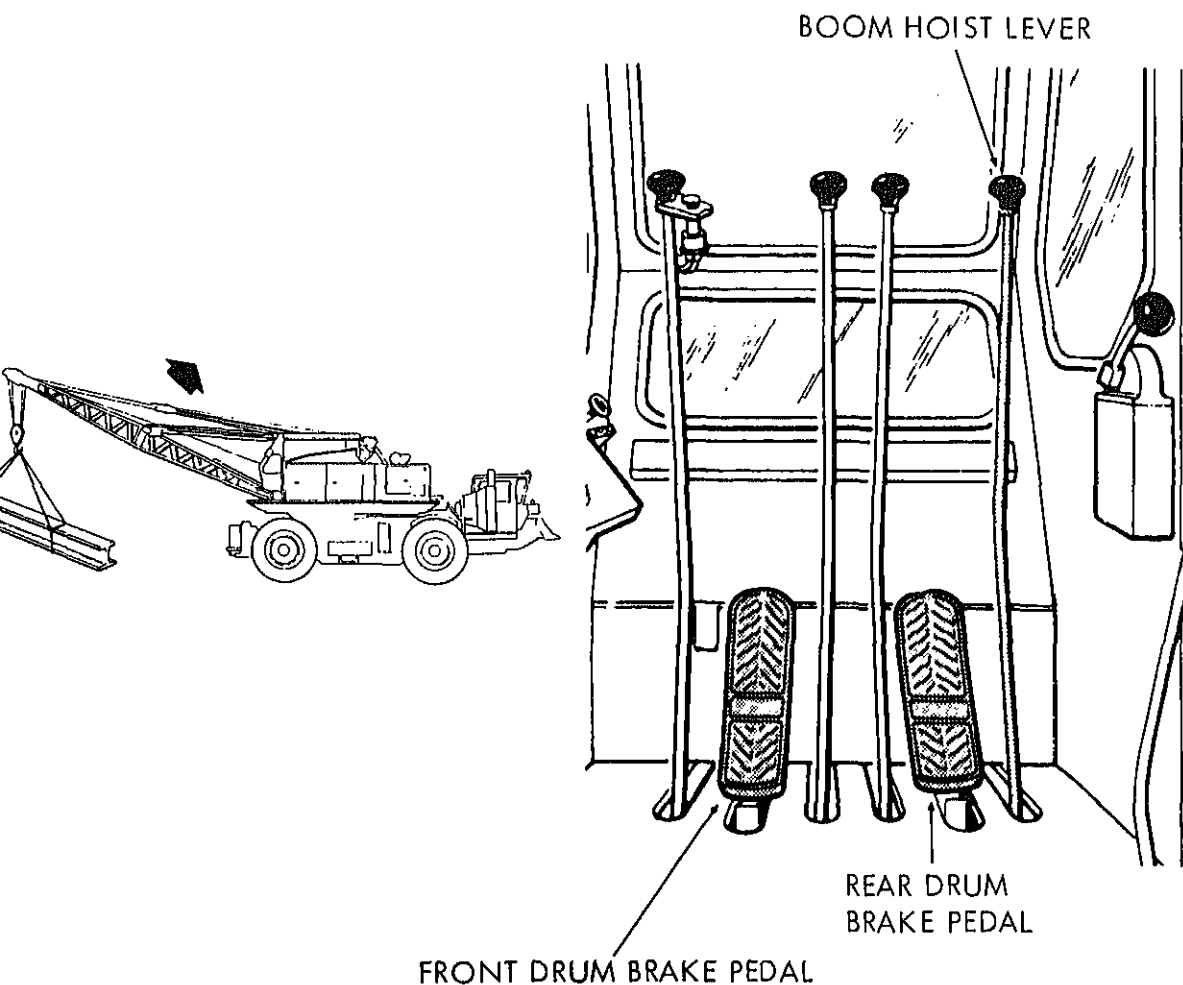
1. KEEP DRUM BRAKE APPLIED WHILE SWINGING.
2. PULL SWING CLUTCH LEVER TO SWING TO RIGHT OR PUSH LEVER FORWARD TO SWING TO LEFT. ENGAGE LEVER SLOWLY SO SWING WILL BE SMOOTH.
3. STOP SWING BY GENTLY AND SMOOTHLY ENGAGING LEVER IN THE OPPOSITE SWING POSITION.
4. ENGAGE THE SWING BRAKE LEVER TO KEEP CAB FROM DRIFTING WHEN ACCURATE SPOTTING IS REQUIRED.



ARNING: NEVER BOOM OUT SO FAR THAT THE RATED LOAD IS EXCEEDED.

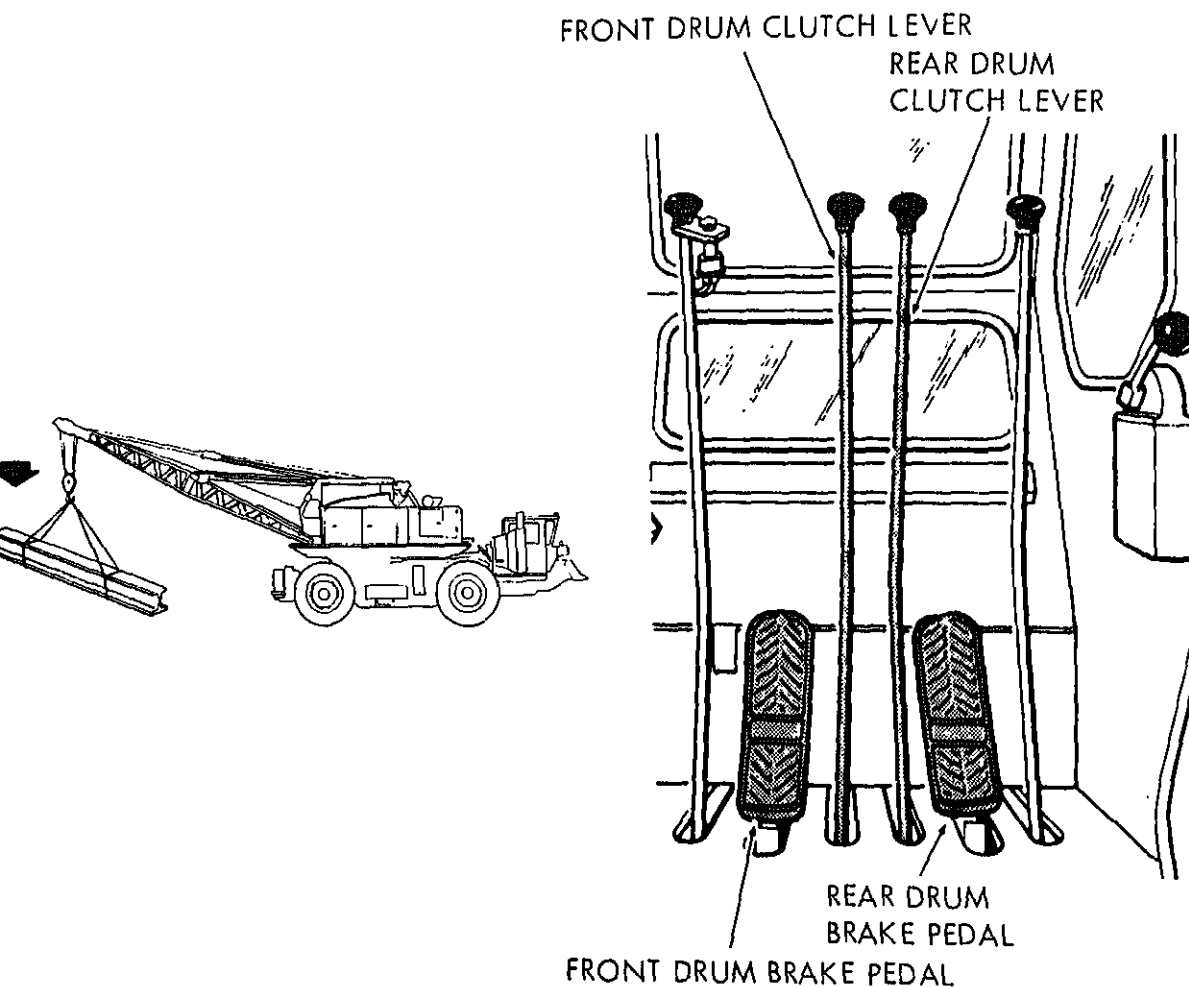
SPOTTING THE LOAD REQUIRES ACCURATE CONTROL OF HOIST AND SWING MOVEMENTS. IT TAKES PRACTICE TO LOCATE THE LOAD AT THE EXACT SPOT WITHOUT HUNTING OR OVERSHOOTING.

RAISE OR LOWER BOOM (FIG. 2-6) AND SWING, LOAD (FIG. 2-8) AS REQUIRED TO MAKE ACCURATE LOCATION OF LOAD.



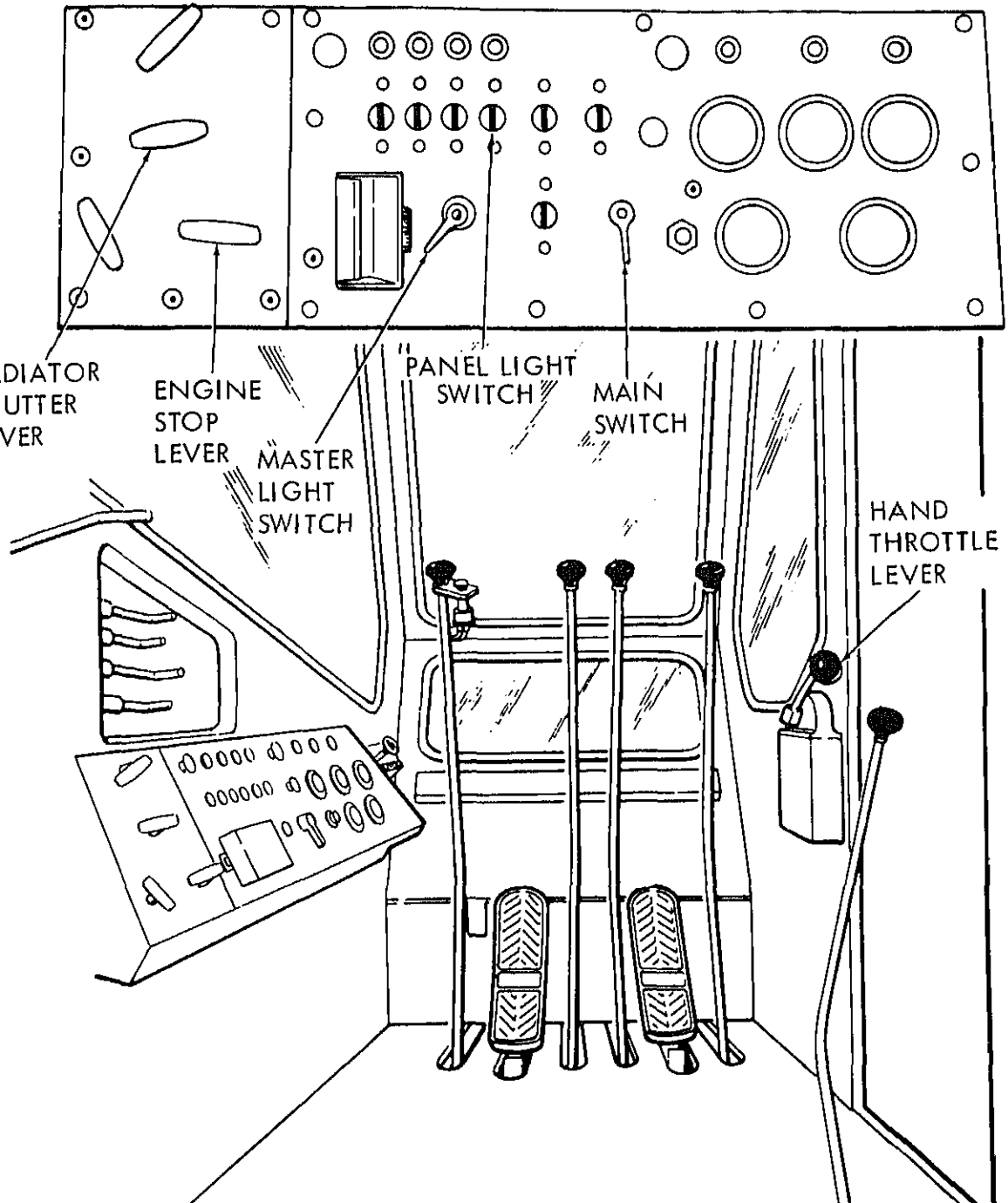
LOWERING LOAD ON FRONT DRUM

1. LOWER FRONT DRUM LOAD BY PUSHING FORWARD ON FRONT DRUM CLUTCH LEVER AND RELEASING FRONT DRUM BRAKE PEDAL. THE LOAD WILL POWER DOWN.
2. RELEASE REAR DRUM CLUTCH LEVER AND CONTROL FREE FALLING LOAD WITH DRUM BRAKE PEDAL.



se all control levers in the neutral position.
all foot brakes and set drum pawls.
rn off floodlights, if being used.
se down the throttle lever to allow engine to

run at half speed or less for several minutes.
will allow engine to cool gradually and pre-
overheating due to localized residual heat.
f. Stop engine as shown on figure 2-11.



the crane and/or carrier could cause these parts to crack or break. Allow crane to reach normal operating temperature before starting work operation. Avoid rough or jerky handling of the equipment. Do not force controls and levers, wait until the engine has warmed up.

WARNING

Personnel should be careful to avoid spilling fuel, coolants or other liquids on themselves as frostbite can result. Extreme care should also be taken to avoid contacting exposed skin to cold metal to prevent serious and painful frostbite.

Lubrication.

(1) Refer to the current lubrication order for information on the proper lubricants to use in cold weather operations.

(2) Check oil level and condition frequently as weather will increase consumption, contamination and sludge formation. If the oil and filter requires changing refer to paragraph 4-22 for the appropriate instructions.

Cooling System.

(1) Prior to initial operation in extreme cold, prime the radiator as described in paragraphs 3-14.

(2) Check the coolant level frequently and watch the temperature gauge closely. If antifreeze is required, refer to TB 750-651 for the proper mixture of antifreeze required to protect the engine against the lowest expected ambient temperature. After adding antifreeze always run the engine to circulate the solution thoroughly.

(3) Inspect the cooling system for leaks. Replace worn, frayed or cracked hoses. Replace damaged hose connections.

Batteries.

(1) Keep the batteries fully charged at all times. Electrolyte in a discharged battery will freeze at a higher temperature than it will in a charged battery. See TM 9-6140-200-12 for information on the charging and testing of batteries.

(2) Remove the battery caps and check the electrolyte level. If the level is low add distilled water. Add water before or while the engine is running, or after adding water charge the batteries. Charging a battery will mix the electrolyte and water, and prevent the battery from freezing.

(3) Keep the battery cables and terminals free

of ice. The crane is used. Keeping the tank full will help prevent condensation and therefore the possibility of a frozen fuel line. If water is noted in the fuel supply, drain the tank and refill with clean fuel. Open petcock on filters to drain water daily.

f. Starting.

(1) At very low temperatures, provide heat to the cab, from an external source, prior to starting the crane.

WARNING

Do not use an open flame as the source of heat.

(2) Start engine using starting aid as follows:

(a) Pull the radiator shutter control (32) out to close radiator shutters.

CAUTION

The starting aid will dispense from 5 cc to 15 cc per second depending on the temperature. Care must be exercised in its use.

(b) Pull starting aid control knob (34, figure 2-4) out for one-half of a second (in below zero temperature hold knob out for about 1 full second).

(c) Push in knob, wait two seconds and operate gage starter as described on figure 2-4.

(3) Let engine reach normal operating temperature before operating crane controls. During the warm-up period only, part or all of the radiator grille may be covered by shutters to speed warm-up time. Immediately after normal operating temperature is reached open radiator shutters.

g. Operation.

(1) Use extreme care in handling of crane. Prevent sudden weight shift when operating on ice or snow.

(2) When using outriggers (see paragraph 2-1) on ice or snow, make sure that the float pads are on solid ground or securely blocked.

h. Shut-down.

(1) Set load on blocks to keep it from freezing to the ground.

(2) Lower load cable to remove load but keep line taut.

(3) Set all drum pawls, and release clutch and brakes.

(4) Turn ignition off. Close all cab openings completely.

2-9. Operation in Extreme Heat

) Insure that the cooling system is clean and flowing. Service, if required, is described in paragraph 3-14.

NOTE

Do not use salt or mineral water solutions in the radiator.

) Check the coolant level often. Keep a close watch on the temperature gage. If water needs to be added while engine is hot, let engine run at fast idle and add water slowly.

) Make sure the water pump and pump drive are lubricated.

) Make sure air is able to flow through radiator core. Remove from the core any bugs, leaves, dirt or other foreign objects.

) Check the fan belt for the proper 1/4- to 1/2 inch deflection per ft.

) If a proper water level cannot be maintained, check for leaks, damaged lines or loose connections.

) If engine continues to overheat, report the condition to organizational maintenance for repair.

Batteries.

) Allow as much air as possible to circulate around the battery.

) Check the electrolyte level frequently. Add distilled water, if necessary, to keep electrolyte level 1/2 inch above battery plates.

Engine.

) Keep air intake and exhaust openings clear. Keep engine clean, and allow air to circulate freely around the engine.

) Throttle the engine sufficiently to handle the load but avoid racing the engine unnecessarily.

) Avoid idling the engine unnecessarily. Shut down the crane if a lull in operations occurs.

Operation in Dusty or Sandy Areas

General. Dust or sand presents special problems due to the damaging abrasive action it has on every part of the crane.

Lubrication.

) Lubricants and lubrication equipment must be kept clean and stored in an area that is free from dust and sand.

) Lubricate the equipment more frequently

when operating in dusty or sandy areas. Keep the radiator core free of sand or dirt. Build-up.

(3) Make sure that the radiator, battery and fuel filler caps are closed tightly to prevent dust or sand from entering. Drain, flush and refill the cooling system if the coolant appears dirty or if the engine is overheating (see paragraph 3-14).

d. Fuel System.

(1) Insure that the fuel tank filler cap is closed securely to prevent sand or dust from entering the fuel system. Drain and refill the fuel tank and replace fuel filters if sand or dirt is found in the fuel.

(2) Service the fuel filters frequently to prevent clogging.

e. Revolving Frame Roller Circle. Inspect the roller circle frequently to insure that sand or dirt has not collected. Keep roller circle free of lubricant which will collect sand and cause damage because of its abrasiveness.

f. Clutches and Brakes. Keep clutch and brake bands free of dust and sand. Sand or dust will quickly wear out or otherwise damage band and linings if allowed to collect there.

g. Cables. Keep unused cables clean by storing them in a tightly covered storage box. Keep cables that are in use, clean to prevent damage because of the abrasive action of collected sand.

h. Open Gearwork. Try to keep gears and moving parts protected against blowing sand. Inspect these parts frequently. If any of these parts are lubricated and has collected sand, wipe clean and relubricate with the appropriate lubricant.

2-11. Operation in High Humidity and High Water Areas

a. General. Moisture causes rust and corrosion, and these are the main problems to deal with in high humidity and salt water areas.

b. Wiring. Although the crane wiring has been treated with anti-fungus solution it is important to inspect all wiring and connections. Look for corrosion, cracks or broken insulation. Report deficiencies to organizational maintenance.

WARNING

To prevent electrical shock, prior to performing any work on the electrical system, disconnect and pull the battery disconnect switch located

2. Operation at high Altitudes

General. The lower atmospheric pressure and

(3) Frequently check and service the air cle

Section I. LUBRICATION INSTRUCTIONS

General

This section contains lubrication instructions that in addition to the instructions contained in maintenance orders LO 5-3810-295-1, -2 and -3.

Lubrication

Storage. Store all lubricants in closed containers in a clean, dry place away from external heat. Keep lubrication equipment clean and ready for use.

Cleaning. Keep all external parts of this equipment not requiring lubrication free of lubricants.

Prior to lubricating the equipment, clean lubrication fittings. After lubrication, clean the equipment of lubricant to avoid accumulation of dirt.

c. Lubrication. Lubricate the equipment at the specified intervals in accordance with LO 5-3810-295-1 and -3.

d. OES Oil. It is important to continually check and maintain proper crankcase oil level. During weather operations oil consumption or contamination may increase, so it may be necessary to check crankcase oil more frequently than indicated in the lubrication order.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

General

It is important to consistently and systematically inspect the crane for defects or possible damage. Performing the checks listed in table 2-1 will enable maintenance personnel to correct defects before they cause damage results. Minor defects discovered during operation should be noted for correction at the earliest opportunity. Any major defect (one that could cause damage to the crane if operation continued) is cause to stop operation immediately and have defect corrected. All defects and corrective

action taken shall be recorded IAW TM 38-100 as soon as possible.

3-4. Preventive Maintenance Checks and Services

See tables 3-1 thru 3-3 for a list of preventive maintenance checks and services. The tables are designed so that if each item is checked in numerical order one or more persons can perform the checks in a minimum amount of time. Table 3-1 is used for operational checks and table 3-2 is used for weekly checks.

Table 3-1. Operator Crew Preventive Maintenance Checks and Services

Before Operation
Required: 2.4

D — During Operation
Time required: 1.1

A — After Operation
Time required: 1.1

| Interval and sequence No. | | Item to be inspected Procedure | When to perform (M) |
|---------------------------|---|--|---------------------|
| D | A | | |
| 1 | | NOTE Visually inspect for evidence of lubricant and fuel leaks concurrently with the daily service checks. | |
| | 1 | FUEL SUPPLY Refill fuel tank as required. | 0 |
| | 2 | RADIATOR Check and add water (3/4 inch above baffle plate) as necessary. Drain, flush and refill cooling system if coolant is excessively dirty. | 0 |
| | 3 | RAIN SHUTTERS Open before starting engine — close after stopping engine. | 0 |
| | | FIRE EXTINGUISHER | |

| H | D | A | |
|--|----|----|--|
| 7 | | | AIR CLEANER Check for excessive dirt. Clean or service as described in paragraph 3-11. |
| 8 | | 4 | CABLES Check all cables and rigging carefully. Have organizational maintenance repair or replace as required. Insure spreader and gantry sheaves are well lubricated. |
| 9 | | | DRIVE BELTS Check belt deflections as described in paragraph 3-16. |
| | 1 | | ALTERNATOR Check ammeter to insure alternator is charging batteries. Repair or replace generator as required. |
| 10 | | | BOOM Check boom for cracks, broken welds or other damage. Refer damage to organizational maintenance personnel for repair. |
| 11 | | | SWING LOCK Check swing lock assembly for damage. Refer to organizational maintenance personnel for repair. |
| 12 | | | SPREADER Check spreader for damage. Repair as required. See paragraph 3-21. |
| 13 | 2 | 5 | DIGGING DRUM CLUTCH Check for smooth operation. Refer to paragraph 3-22 and adjust as required. |
| 14 | 3 | 6 | HOIST CLUTCH Check for smooth operation. Adjust as described in paragraph 3-22 |
| 15 | 4 | 7 | BOOM HOIST CLUTCH Check for operation. Adjust as described in paragraph 3-23 |
| 15 | 5 | 8 | LEFT SWING CLUTCH Check for smooth operation and adjust, if required, as described in paragraph 3-24 |
| 16 | 6 | 9 | REVERSING AND RIGHT SWING CLUTCH Check for smooth operation and adjust as described in paragraph 3-24 |
| 17 | 7 | 10 | HOIST AND DIGGING BRAKE Check for smooth operation. Adjust as described in paragraph 3-25. |
| 18 | 8 | 11 | SWING BRAKE ASSEMBLY Check operation. Adjust as described in paragraph 3-26. |
| 19 | 9 | 12 | BOOM HOIST BRAKE Check mechanical components for damage. Check operation, and adjust as described in paragraph 3-25. |
| | 10 | | CONTROLS With the crane running, operate all controls and check for smooth and correct operation. Adjust cables, rods, pedals, shafts and levers as necessary. |
| | 11 | | GAUGES With the crane running, check all gauges for the readings listed below: Temperature — 160°F. to 200°F. Oil pressure — 45 PSI (max) Tachometer — 1980 (±25) rpm |
| <p style="text-align: center;">NOTE</p> <p>During operation continue to observe gages. Be alert to any unusual noises, vibrations or faulty operating conditions.</p> | | | |

Table 3-2. Operator Crew Preventive Maintenance Checks and Services

D — During Operation
Time required: 1.1

W—We
Time r

| Interval and sequence No. | | |
|---------------------------|---|---|
| | D | W |

Item to be Inspected
Procedure

| D | W | Procedure | th (M) |
|---|---|---|-----------|
| | 2 | FUEL FILTER Drain water and sediment from filter bowl. Replace filter if excessively dirty or after 500 hours of operation. | 0 |
| | 3 | HYDRAULIC TANK Check fluid level. Add fluid if required (see LO 5-3810-295-12). | 0 |
| | 4 | CRANKCASE OIL Check crankcase oil level. Add oil if required. See LO 5-3810-296-12 for proper lubricant. Change oil if excessively dirty. | |
| | 5 | CRANKCASE OIL FILTER Check oil filter and replace in accordance with LO 5-3810-295-12. | 0 |
| | 6 | CRANE Run crane and check operation of all controls, drums, clutches, and gages as detailed in table 3-1. | 1 |

Section III. TROUBLESHOOTING

General

This section provides a useful guide for determining and correcting unsatisfactory operation or malfunction of the crane and crane components. If the crane still malfunctions after performing corrections indicated in this section, refer the equipment to organizational maintenance for more extensive troubleshooting.

3-6. Operator/Crew Maintenance Troubleshooting

The troubleshooting chart, table 3-3, lists possible malfunctions, tests or inspection to determine cause of malfunction and corrective actions to be taken. Perform the tests/inspections and corrective actions in the order that they are listed.

Table 3-3. Troubleshooting Chart

| FUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|--|--|--|
| ENGINE WILL NOT CRANK. | | |
| Step 1. | Check master and battery disconnect switch for the ON position. | Turn switches ON. |
| Step 2. | Check for discharged batteries and low electrolyte level. | Have organizational maintenance charge or replace discharged or damaged batteries. |
| Step 3. | Check battery cables, terminals and ignition wiring for breaks, loose connections, and corrosion. | a. Clean battery terminals and cables of corrosion. Lubricate cables and terminals described in LO5-3810-295-12. b. Replace damaged cables. Replace or splice broken ignition wiring. |
| Step 4. | Check to see if starter is engaging engine flywheel when starter button is depressed. Listen for a spinning or clicking sound at the starter indicates a faulty starter. | Have organizational maintenance repair starter. |
| ENGINE CRANKS, BUT TOO SLOW TO START. | | |
| Step 1. | If engine has not been started within a few days the fuel lines may be empty | |

adding to the red line when the engine is cranking; see paragraph 3-13.

perform necessary battery inspections and service.

Step 6. If engine still does not start refer equipment to organizational maintenance.

ENGINE OVERHEATS.

Step 1. Check position of rain shutters.

Open rain shutters.

Step 2. Check level of coolant in radiators. If radiator is low check for leaks.

Refill radiator with proper coolant as described in paragraph 3-14.

Step 3. Check engine oil level.

Add oil as detailed in LO5-3810-295-12. Refer equipment to organizational maintenance if oil consumption is abnormally high.

Step 4. Check fan and water pump V-belt for proper tension (fig. 3-5, para 3-16).

Have organizational maintenance adjust V-belt to proper tension (fig. 3-5, p

LOW OIL PRESSURE.

Step 1. Check oil level.

Add oil as required.

Step 2. Check for oil leaks.

Repair as required.

REVOLVING FRAME WILL NOT SWING.

Step 1. Check to see if crane lock is engaged.

Disengage lock lever (7, fig. 2-1).

Step 2. Check to see if swing clutch is engaging.

Adjust swing clutch as described in paragraph 3-24.

Step 3. Check to see if swing brake is engaged.

Disengage swing brake.

Step 4. Check swing brake adjustment.

Adjust swing brake as described in paragraph 3-26.

CRANE WILL NOT LIFT RATED CAPACITY.

Step 1. Check load drum clutch for slippage.

Adjust front or rear drum clutch as described in paragraph 3-22.

Step 2. Check hydraulic system fluid level.

Add fluid and bleed system as required.

BOOM WILL NOT RAISE.

Step 1. Check boom hoist clutch adjustment.

Adjust boom hoist clutch as described in paragraph 3-23.

Step 2. Check hydraulic system fluid level.

Add fluid and bleed system as required.

LEVERS OR PEDAL OPERATION FAULTY.

Step 1. Check lever or pedal adjustment.

Adjust as described in paragraphs 3-27 and 3-28.

Step 2. Check hydraulic system fluid level.

Add fluid and bleed system as necessary.

LOAD/MOMENT SAFETY DEVICE FAILS TO OPERATE.

Step 1. Visually inspect electrical circuit for shorts, loose or disconnected wiring. Refer to 1-8.

a. Tighten, splice or replace damaged wiring.

b. Make sure circuit is moisture free and connections are sealed properly.

Step 2. Check for defective or blown fuse. Fuse indicator light will be on. Replace defective fuse.

LOAD/MOMENT SAFETY DEVICE INDICATOR GIVES ERRONEOUS READING.

Step 1. Check for dirty contact on program cards.

Clean programs contacts with pencil eraser.

Step 2. Check to see if indicator needle is stuck.

Tap meter face lightly to free needle.

Step 3. Check program card to make sure appropriate program card for operation and boom has been inserted.

Insert correct card.

Step 4. Check to insure that float/tire switch is in appropriate position.

Position switch accordingly.

LOAD/MOMENT SAFETY DEVICE BELL RINGS CONTINUOUSLY.

Step 1. Make sure the load or boom angle does not exceed safe limit. Refer to rating data plate for limits.

Adjust load or boom angle as required.

Step 2. Check angle transducer cable connections at both ends for secure connections.

Hand tighten connections at both ends.

Step 3. Check all circuit cables for breaks or other damage.

Replace damaged cables.

Step 4. Check to see if angle warning limits as set in paragraph 2-5d has been surpassed.

If there is no longer a need for the adjusted angle limits, readjust as described in paragraph 2-5d.

Step 5. Check to see if the angle transducer sector is stuck or otherwise damaged.

Replace damaged sector or adjust setscrew to free stuck sector.

Section IV. MAINTENANCE OF FUEL SYSTEM

General

The following section contains maintenance procedures that can be performed by the operator/crew as allocated by the maintenance allocation chart (MAC). The order of coverage is the same as prescribed in the MAC (See appendix C for details of the MAC).

3-8. Engine Fuel Filter and Strainer Service

Clean and service the fuel filter as described in figure 3-1.

3-9. Engine Fuel Lines Inspection

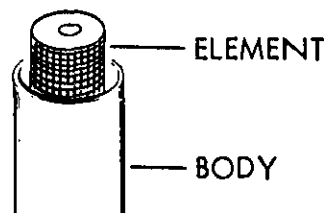
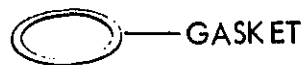
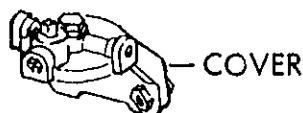
Starting at the fuel tank follow fuel lines to the engine and inspect for loose connections, cracks and leaks.

STEP 1. OPEN DRAIN COCK AND DRAIN FUEL INTO SUITABLE CONTAINER.

STEP 2. UNSCREW BODY, REMOVE AND DISCARD ELEMENT AND GASKET.

STEP 3. CLEAN INSIDE OF BODY AND COVER.

STEP 4. INSTALL NEW ELEMENT AND GASKET.

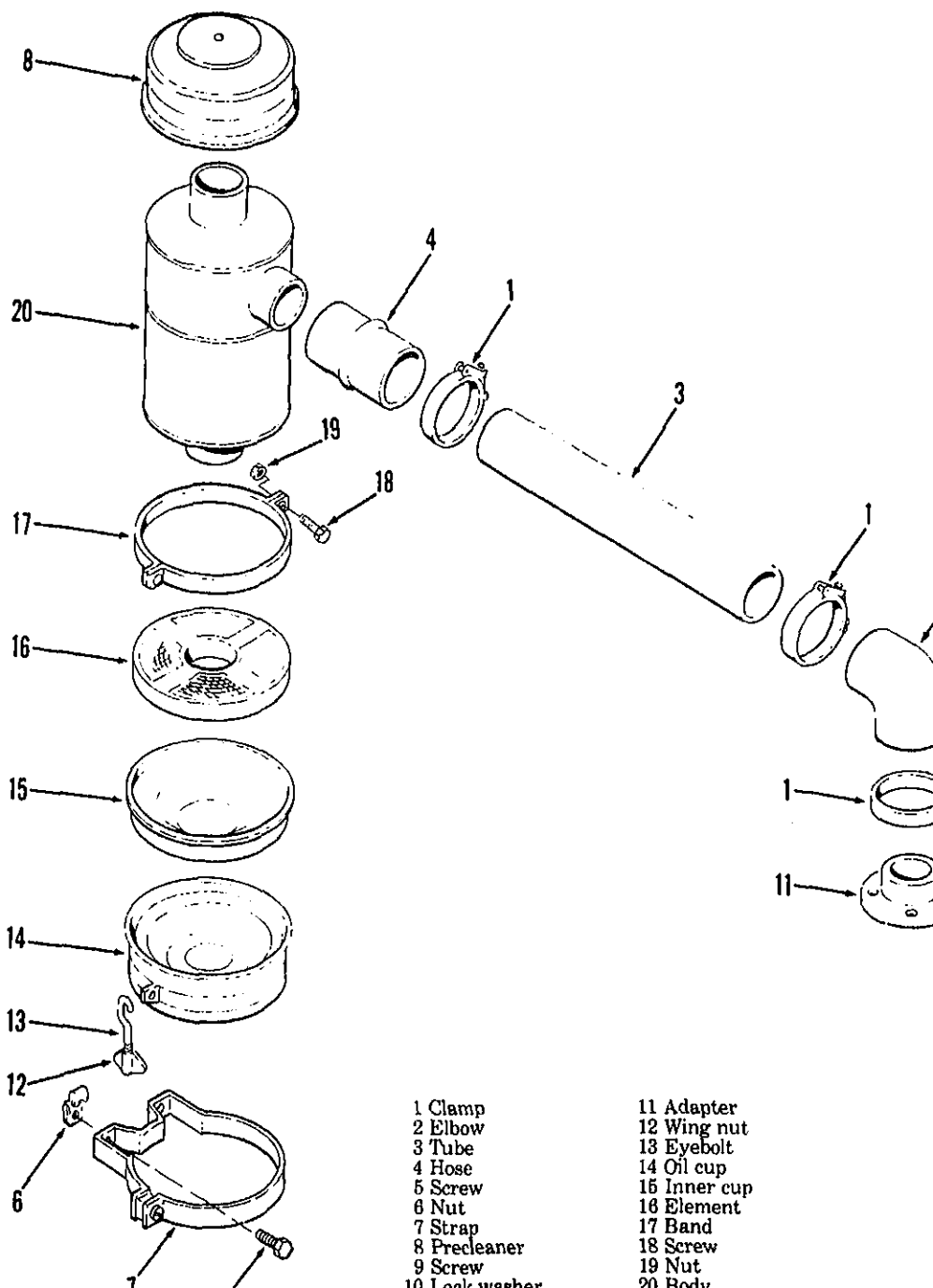


3-11. Air Cleaner

a. *Inspection.* Refer to figure 3-2 and inspect the air cleaner as follows:

b. *Service.* Refer to figure 3-2 and inspect the cleaner as follows:

(1) Remove precleaner (8) and clean with approved cleaning solvent.



- 1 Clamp
- 2 Elbow
- 3 Tube
- 4 Hose
- 5 Screw
- 6 Nut
- 7 Strap
- 8 Precleaner
- 9 Screw
- 10 Lock washer

- 11 Adapter
- 12 Wing nut
- 13 Eyebolt
- 14 Oil cup
- 15 Inner cup
- 16 Element
- 17 Band
- 18 Nut
- 19 Nut
- 20 Body

cup (18) and element (19).
Drain oil from oil cup and clean both cups and
t with an approved cleaning solvent. Dry

(4) Fill the cup with clean oil as specified in
LO5-3810-295-12.

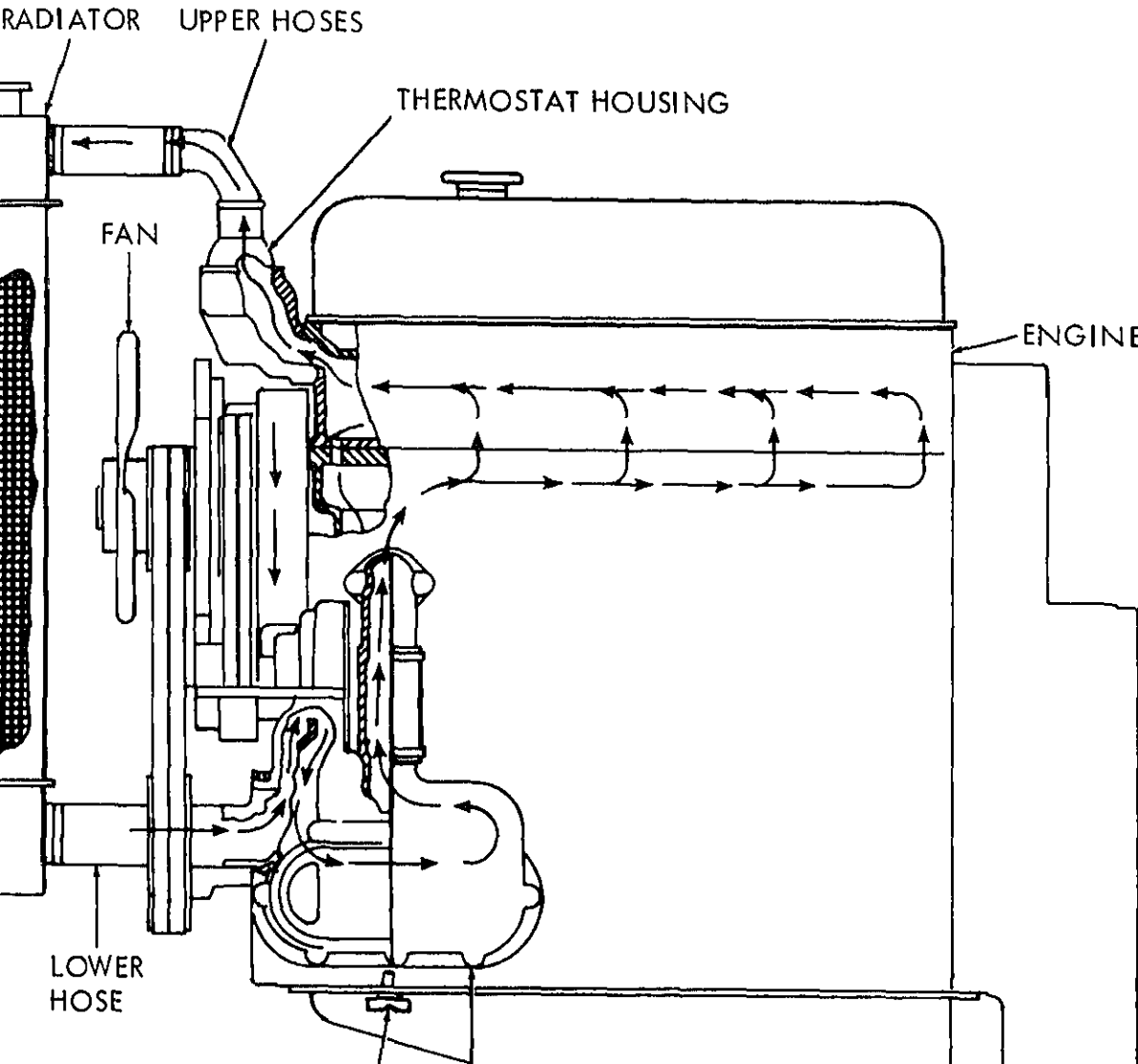
(5) Reassemble air cleaner.

Section VI. MAINTENANCE OF COOLING SYSTEM

General

Proper care of the cooling system is important
to maintain efficient engine operation and to pre-

vent serious engine damage from overheating.
The cooling system basically consists of the radiator,
cooler, water pump, water filter, fan, thermostat
and hoses and connections. See figure 3-3.



...forced out under pressure.
...ch, through the thermostat back to the radiator. If the normal operating temperature has been reached the thermostat will close and prevent water from circulating further until proper temperature is obtained.

3. Inspection

Before starting engine (engine cold) remove radiator cap and check level (three-fourths of an inch above, baffle plate) and condition of coolant. If coolant level is low or appears excessively dirty, service the radiator as described in paragraph 3-14.

Start the engine and check the radiator for leaks. Check all hoses, connections, and radiator cap leaks. Check for leaks around thermostat, oil cooler, filter and water pump housings.

Allow sufficient time for the engine to warm up and check temperature gauge in cab for normal reading (160° — 185°F). If temperature does not reach 160°F. after sufficient warm-up time, report equipment to organizational maintenance as this may indicate a faulty thermostat. If temperature reaches a level in excess of 180°F. shut-down machine and service as detailed in paragraph 3-14.

Section VII. MAINTENANCE OF ELECTRICAL SYSTEM

5. Battery Inspection and Service

WARNING

It is always important to use care when working on the electrical system. To prevent electrical shock and/or damage to the equipment pull the battery disconnect switch (fig. 3-4).

a. Lift cover clamps and remove battery box cover. Tighten any loose mounting hardware.

b. Check battery cables for frays, breaks or loose connections. Check battery for broken terminal posts, cracks or other damage.

c. Remove the battery caps and check the electrolyte level. Electrolyte level should be three-eighths of an inch above plates. Add distilled water if level is

forced out under pressure.
a. *Drain.* Loosen radiator cap and open the cocks located on the bottom of the oil cooler and forward of the air blower. See figure 3-3. Remove radiator cap.

b. *Cleaning.* Flush the cooling system as described in TB 750-651. Remove dirt and other foreign objects from between the radiator core using compressed air.

c. *Fill* Close all drain cocks. Refill the 25 gallon capacity cooling system with an anti-freeze solution as described in TB 750-651. Insure the anti-freeze mixture is sufficient to protect the engine against temperature safely below the lowest expected ambient weather conditions.

d. *Start.* Check for leaks at drain-cocks and connections. Start and warm-up engine. Check for leaks, carefully remove cap and recheck coolant level. If required add coolant to a level three-fourths of an inch above radiator baffle plate. If a normal operating temperature is still not reached or if it exists turn the crane over to organizational maintenance for repair.

and cables as specified in LO 5-3810-295-12.

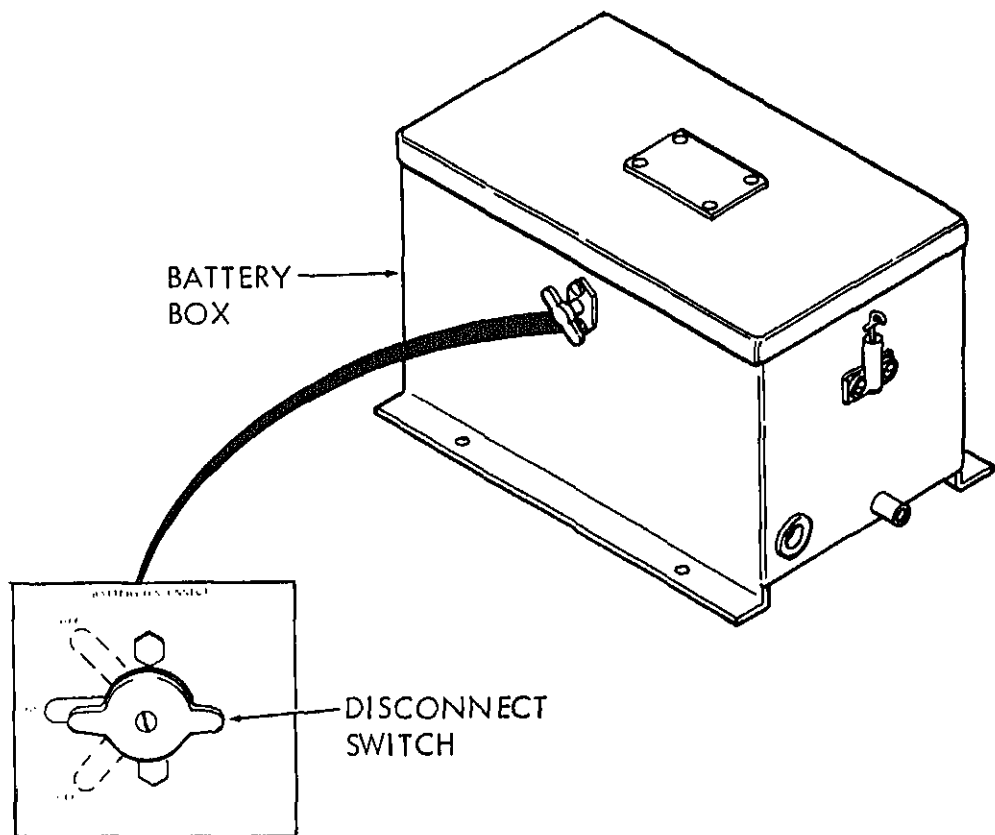
e. If further testing or servicing is required disconnect equipment over to organizational maintenance action.

f. Replace cover and secure with clamps. Disconnect switch in to restore electrical power to crane. In freezing weather run engine for at least one hour if distilled water has been added.

3-16. Alternator Belt-Service

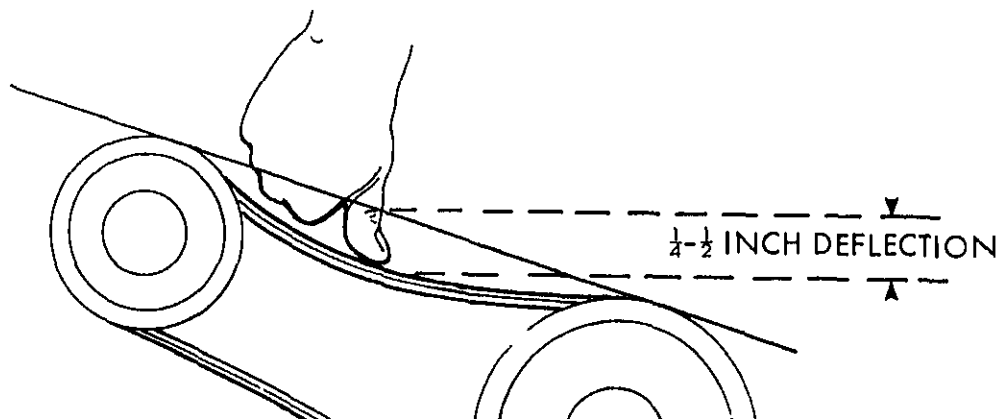
a. If the alternator belts are too loose, the alternator will not provide a proper charge to the battery. If the belts are too tight it can cause damage to the pulley bearings. Check for the proper 1/4-inch deflection as shown in figure 3-5.

b. Check the belts for wear and damage.



ITA032

Figure 3-4. Battery disconnect switch.



or latch catches in both positions.

Check for smooth operation of door rollers.

Inspect weather stripping around door for cracks, cuts and brittle or missing pieces.

Have organizational maintenance personnel make any repairs required.

8. Glass Inspection

Inspect cab window glass as follows:

sure there is no binding or damaged tracks.

c. Inspect lock screws around front windshield for damage or missing parts.

d. Inspect weatherstripping around all windows for cuts, cracks and brittle or missing pieces.

e. Have organizational maintenance personnel replace any damaged or missing parts.

Section IX. MAINTENANCE OF ACCESSORY ITEMS

9. Defroster Fan Inspection

1. Inspect the fan and fan blades for damage.

2. Make sure the fan is mounted properly so that air flow is directed at the windshield.

3. Check the fan electrical connections for frays or leaks.

4. Refer any defects to organizational maintenance for repair.

3-20. Windshield Wiper Inspection

a. Check the wiper blade for signs of wear.

b. Check wiper arm for sufficient pressure to hold wiper blade flush against windshield during operation.

c. Start engine and turn windshield wiper on long enough to insure it works properly.

d. Have organizational maintenance personnel repair or replace any defective parts.

Section X. MAINTENANCE OF HYDRAULIC SYSTEM

10. Hydraulic System Inspection

1. *Hoses, Fittings and Tubing.* Inspect hydraulic lines as follows:

(1) Start crane engine and operate control levers briefly.

(2) Place all controls in neutral and shutdown crane engine.

(3) Start at the reservoir and inspect the hy-

draulic lines to the brakes, clutches and master cylinders for leaks.

b. Tighten any loose fittings. Report any damage to the hydraulic system to organizational maintenance.

c. Check the fluid level in the reservoir. If necessary replenish with the appropriate type of fluid specified in lube order.

Section XI. MAINTENANCE OF CABLES, BOOM COMPONENTS, DRUMS, CLUTCHES AND CONTROLS

11. Front and Rear Drum Clutch

1. *Service.* Keep the components of the clutch clean and dry. Make sure that hydraulic fluid never comes in contact with clutch linings.

2. *Adjust.* Adjust the front and rear drum clutches as follows:

(1) Place the front and rear drum clutch levers in neutral and shut-down the crane engine.

(2) Turn the main switch to OFF position. Tap

3-23. Boom Hoist Clutch

a. *Service.* Keep the components of the boom hoist clutch clean and dry. Make sure that hydraulic fluid never comes in contact with clutch linings.

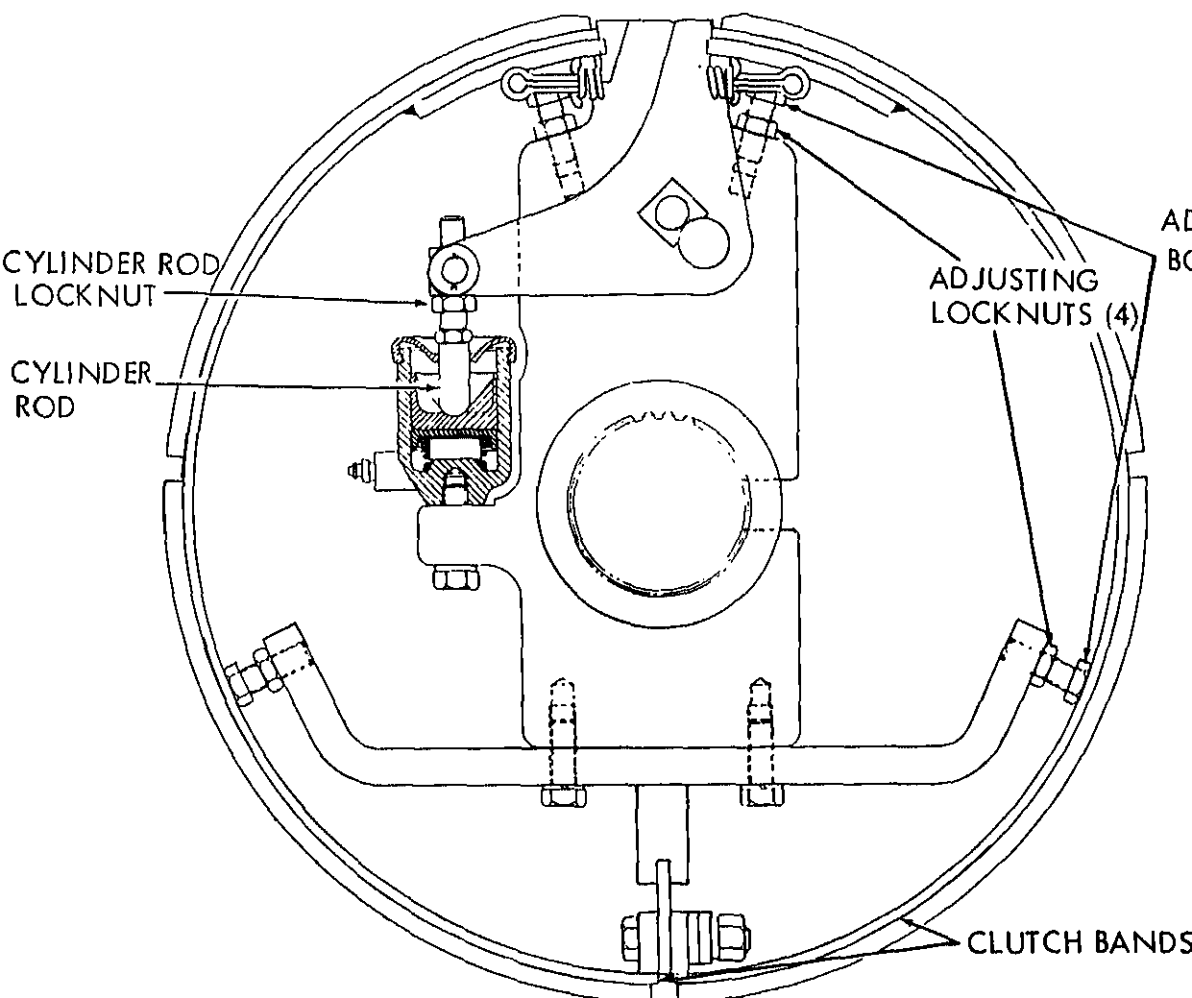
b. *Adjust.* Adjust the boom hoist clutch as follows:

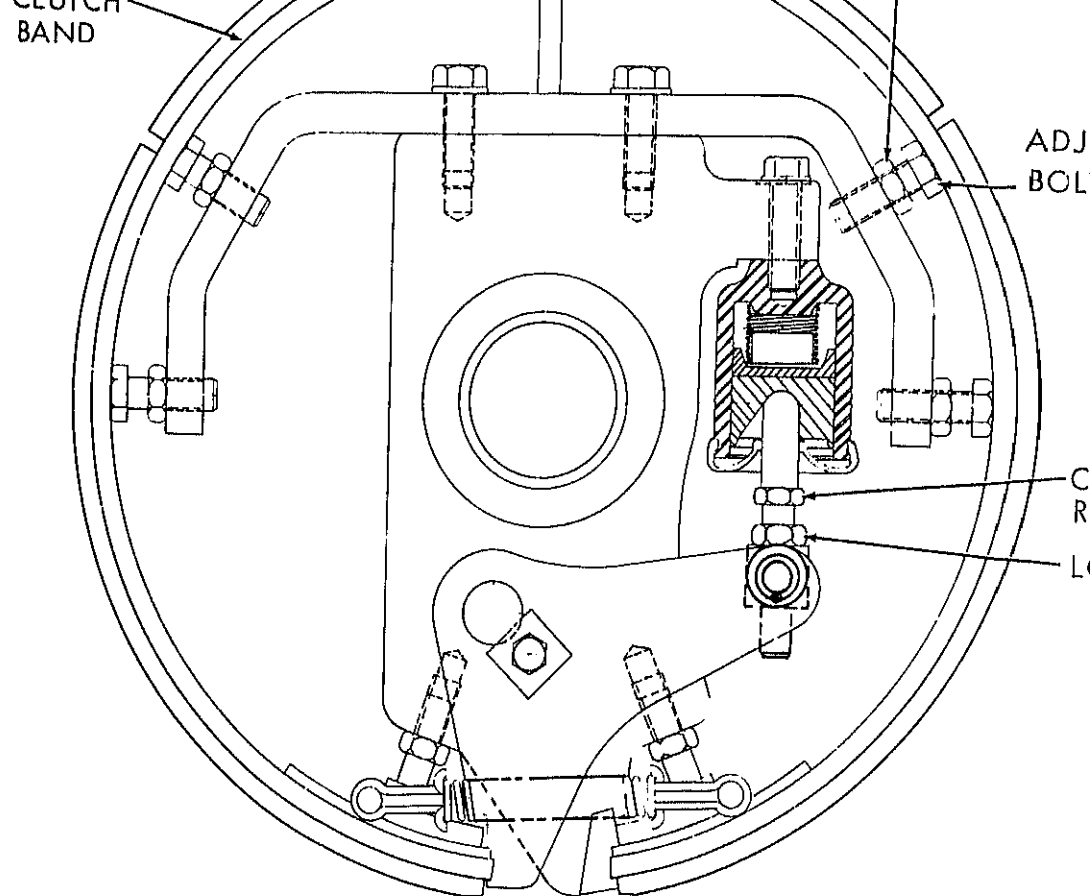
(1) Place the boom hoist clutch in neutral and shut down the crane engine.

(2) Turn the main switch to the OFF position.

NOTE: ONLY STEPS 1 AND 5 ARE NECESSARY TO ADJUST FOR LINING WEAR. USE COMPLETE PROCEDURE WHEN INSTALLING NEW CLUTCH BANDS.

- STEP 1. LOOSEN FOUR ADJUSTING LOCKNUTS.
- STEP 2. TURN ADJUSTING BOLTS UNTIL THE CLUTCH BANDS ARE CENTERED. THEY MUST BE EQUALLY SPACED FROM THE DRUMS ON BOTH SIDES.
- STEP 3. TIGHTEN LOCKNUTS.
- STEP 4. LOOSEN CYLINDER ROD LOCKNUT.
- STEP 5. ATTACH A SPRING SCALE TO THE APPROPRIATE CLUTCH LEVER AND ADJUST CYLINDER ROD UNTIL A 15-20 LBS PULL ON SPRING SCALE WILL ENGAGE CLUTCH.

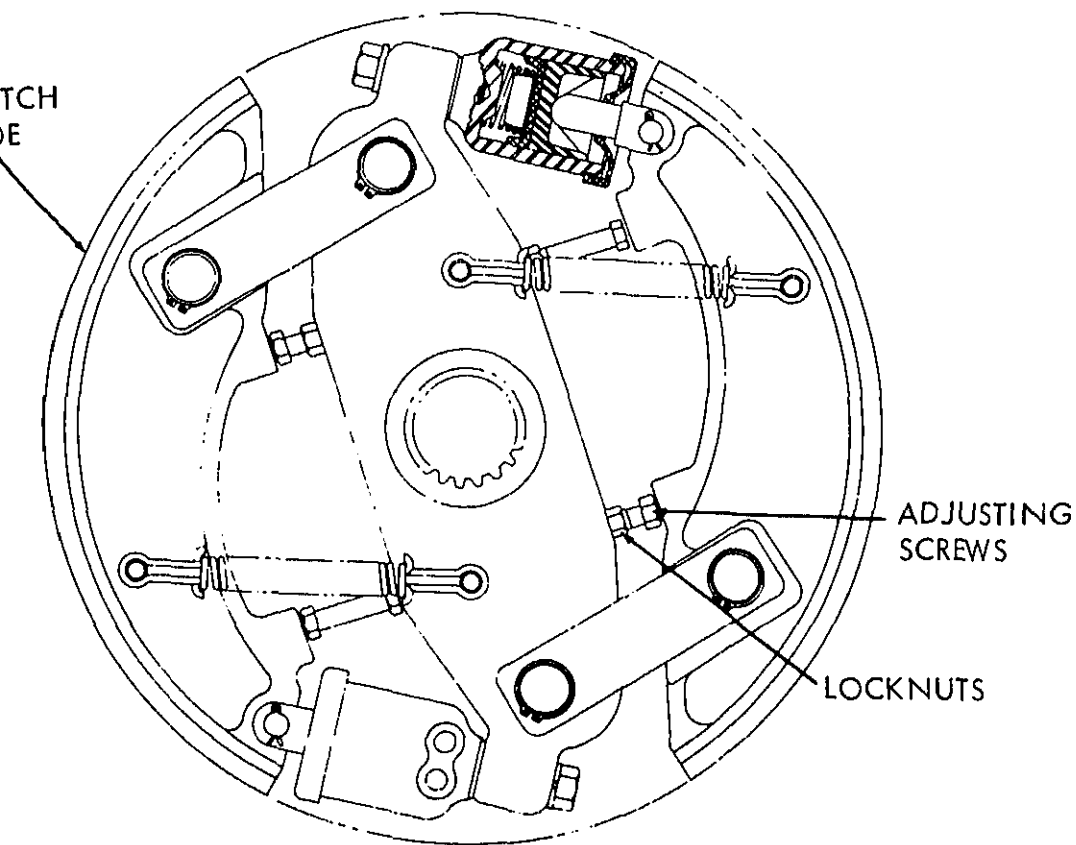




NOTE: ONLY STEPS 4 AND 5 ARE NECESSARY TO ADJUST FOR LINING WEAR. USE COMPLETE PROCEDURE WHEN INSTALLING NEW CLUTCH BANDS.

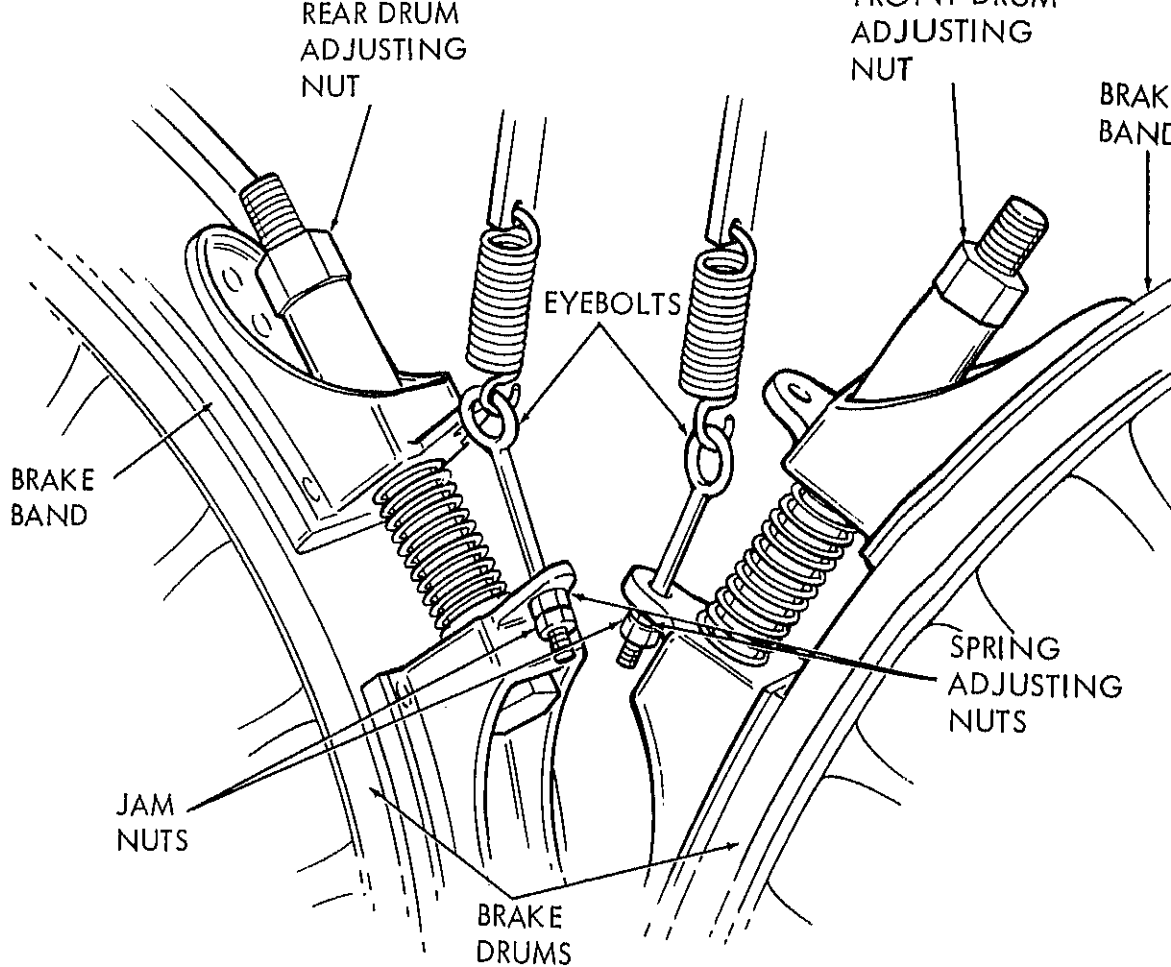
- STEP 1. LOOSEN FOUR ADJUSTING LOCKNUTS.
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LOOSEN LOCKNUTS.
ENGAGE THE SWING CLUTCH LEVER.
BACK OFF THE FOUR ADJUSTING SCREW UNTIL THERE IS A 0.020 INCH GAP
BETWEEN THE ADJUSTING SCREW HEADS AND CLUTCH SHOES.
TIGHTEN LOCKNUTS AND RECHECK GAP.



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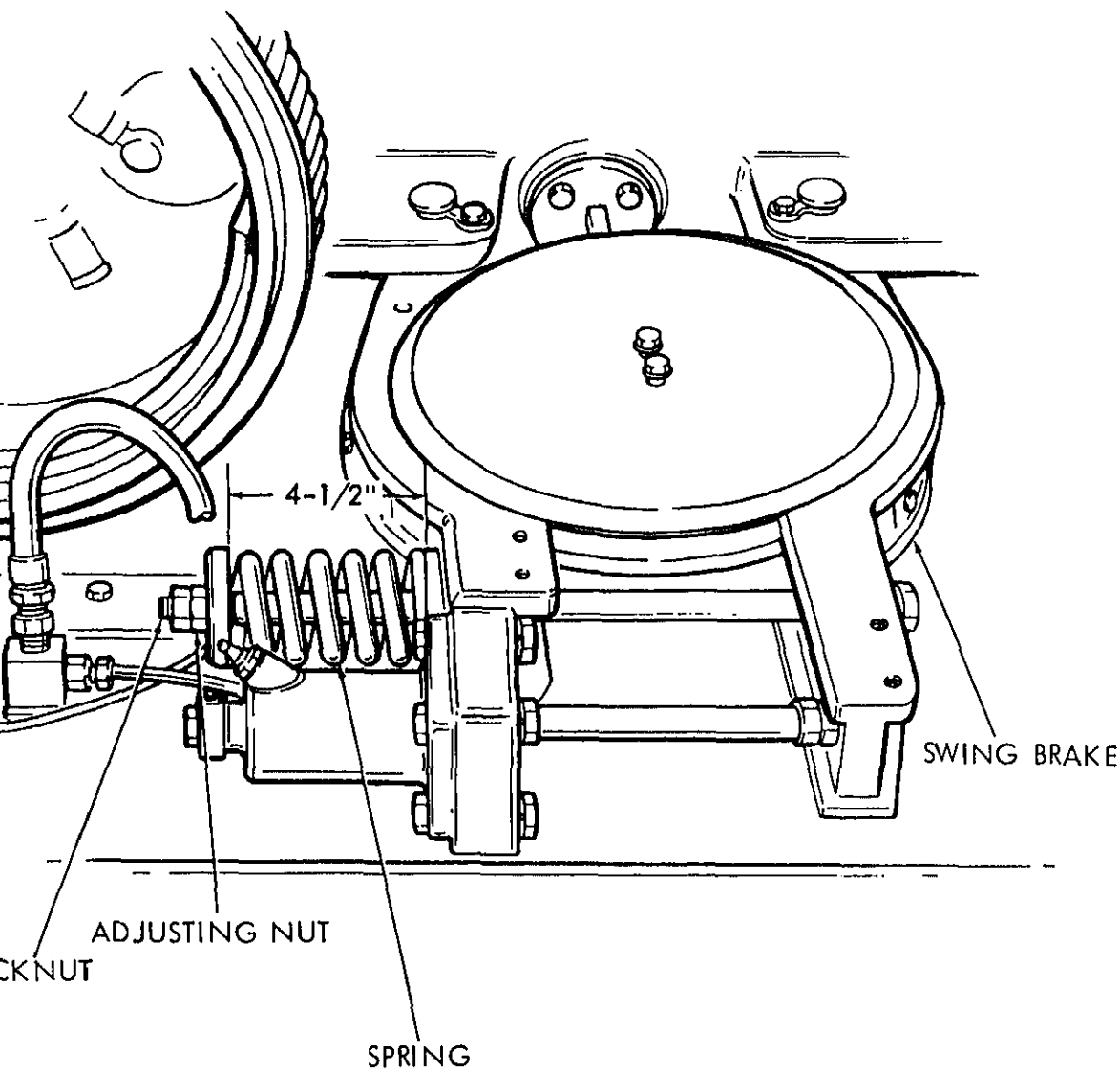
Figure 3-8. Reversing shaft and swing shaft clutch adjustment.



- STEP 1. LOOSEN JAM NUTS AND ADJUST SPRING ADJUSTING NUTS UNTIL BRAKE BANDS DO NOT RIDE ON BRAKE DRUMS.
- STEP 2. TIGHTEN FRONT DRUM AND REAR DRUM ADJUSTING NUT.
- STEP 3. CHECK ADJUSTMENT BY LIFTING CAPACITY LOAD A FEW INCHES OFF GROUND. HOLD BY APPLYING FRONT OR REAR DRUM BRAKE AND SEE BRAKE DOES NOT SLIP.

Figure 3-9. Front and rear drum brake adjustment.

2. TIGHTEN ADJUSTING NUT UNTIL SPRING IS 4-1/2 INCHES LONG AS SHOWN.
3. TIGHTEN LOCKNUT.



(TA032969)

Figure 3-10. Swing brake adjustment.

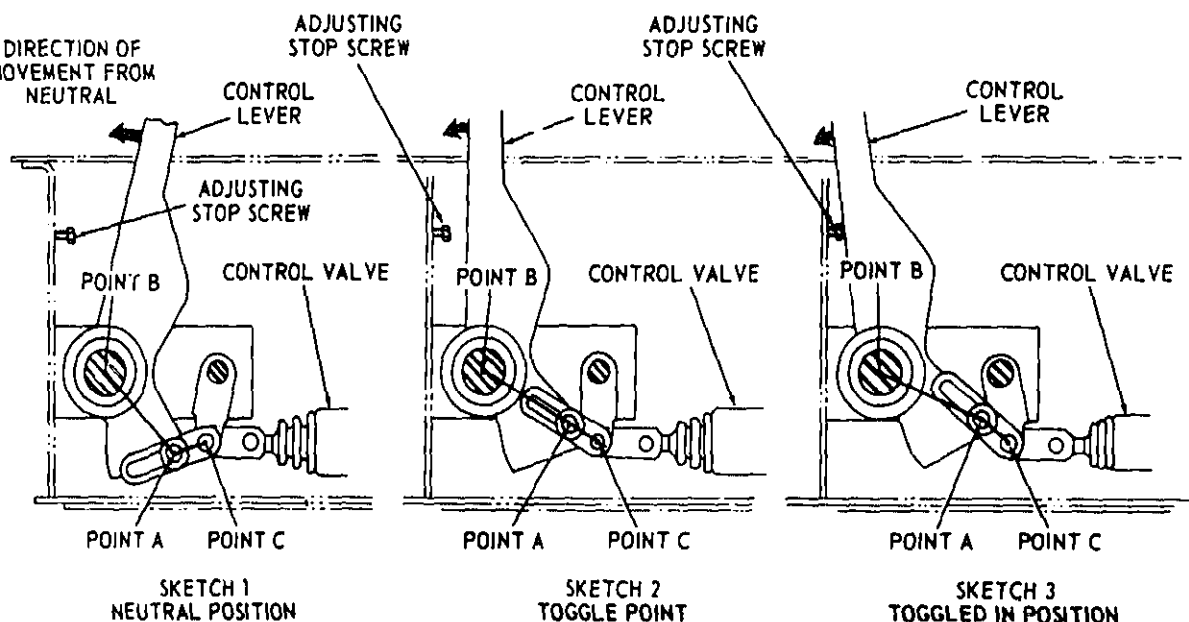
Toggle Lever Adjustment

CAUTION

It is important that only the four levers designed for toggle linkage action and

Figure 3-11 illustrates the principles of operation of the toggle linkage, which must be understood in order to adjust such linkage. When the linkage moves from the neutral position shown in sketch 1, the

ction as it can go. In sketch 3, the control lever



(TA0329)

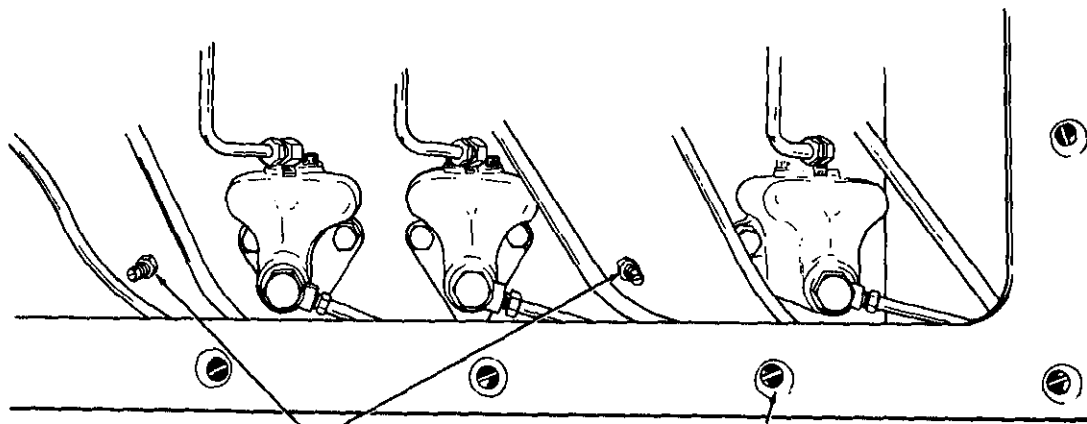
Figure 3-11. Toggle linkage adjustment.

28. Control Levers and Drum Brake Pedals

Service. The only service required for the drum brake pedals is an occasional cleaning to keep pedals free of heavy accumulations of dirt or oil.

Adjustment. Normally no adjustments will be required. There are however, stop screws such as

those illustrated in figure 3-12 to limit the forward movement of all control levers and pedals. It may be necessary, on occasion, to replace or re-adjust the stop screw that is missing or out of adjustment. Spring tension on the front and rear drum brake pedals can be adjusted by tightening or loos-



9. Chain Adjustments

Reversing Shaft Chain. Refer to figure 3-13 and tighten wrench block (Step 2) until the total midspan chain slack is between one-fourth and three-eighths of an inch.

Rear Drum Chain. Refer to figure 3-13 and tighten wrench block until the total midspan chain slack is approximately one-half inch.

Horizontal Swing Shaft Chain. Refer to figure 3-13 and tighten wrench block until the total midspan chain slack is approximately one-half inch.

b. Inspect the capscrews and nuts securing the upper and lower boom sections together for damaged or missing parts.

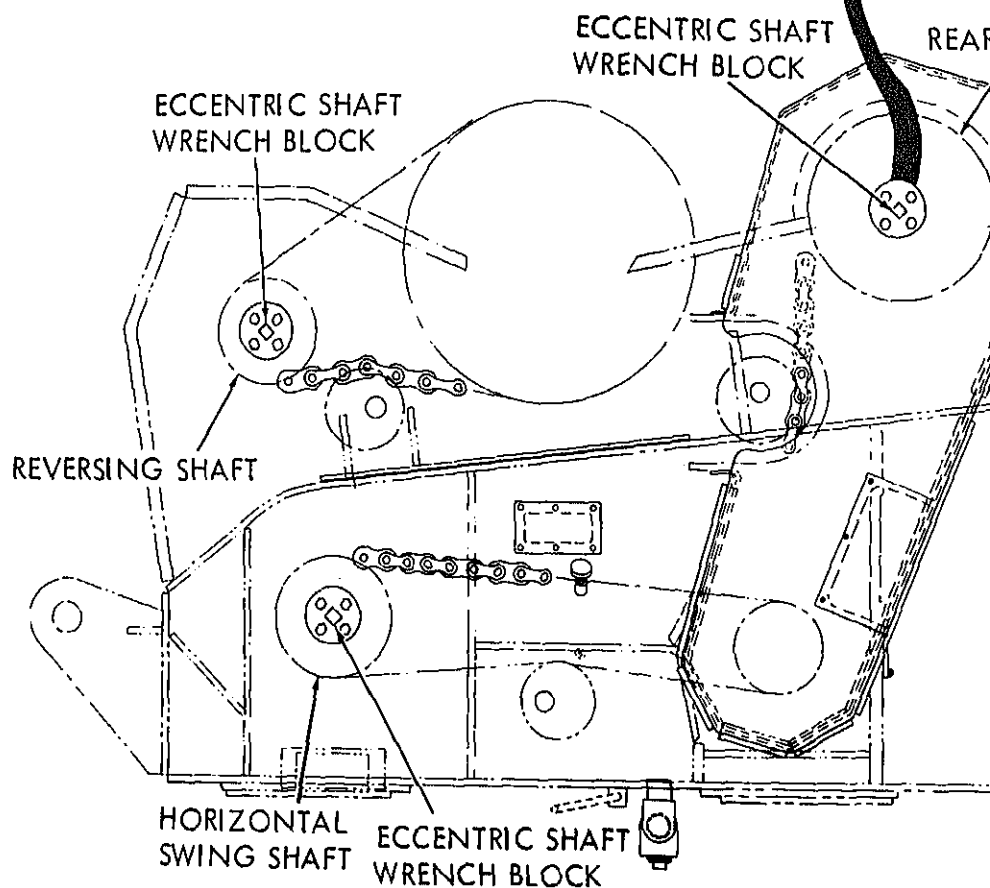
c. Inspect pins and cotter pins securing the lines to the spreader and boom point.

d. Report any damaged or missing boom sections, pins or attaching hardware to organizational maintenance.

3-31. Boom Hoist Cable

a. *Inspection.* Inspect the boom hoist cable for fraying, raveling, kinks and breaks. Check to make sure the cable is not rubbing against the boom, spreader, gantry or engine compartment sheet metal.

- STEP 1. LOOSEN FOUR CAPSCREWS.
STEP 2. TIGHTEN WRENCH BLOCK AS RE-
QUIRED.
STEP 3. TIGHTEN FOUR CAPSCREWS.



Inspecting and Servicing the Equipment

General. If the M320RT has been shipped by air, it will be necessary to remove all tie-downs, straps and blocking. Remove all other packing materials used for shipping.

Inspecting the Equipment.

(1) Inspect the equipment immediately to see if the required publications, tools, accessories, attachments and repair parts have been shipped with the crane and carrier.

(2) Inspect the carrier and crane for damage that may have occurred during shipment. Look for damage to the cab bodies, windows, lights and mirrors.

(3) Further inspect the equipment for damage to the tires, fuel and hydraulic tanks.

(4) Check inside the carrier and crane cab assemblies for damage to gages, instruments, controls, heaters and seats.

(5) Inspect engine compartments for damage such as: loose or damaged wiring, missed or damaged components and hardware. Inspect fuel, water and hydraulic lines for damage or leaks. Inspect filters, drain plugs and breathers for damage or

Servicing the Equipment.

(1) Remove all protective tape and replace any broken or missing lights, bulbs or fuses.

WARNING

Avoid smoking or working near open flame when servicing batteries, fuel tank or using any other explosive materials.

(2) Check the fuel tank and fill both tanks to capacity if low.

(3) Service the batteries as described in paragraphs 4-49 (crane) and 9-39 (carrier).

(4) Service the cooling system as described in paragraphs 3-14 (crane) and 8-11 (carrier).

(5) Check the engine oil level, if oil is low or appears contaminated. Service as described in paragraph 4-22 (crane) or paragraph 9-23 (carrier).

(6) Check the hydraulic fluid reservoirs and add (specified in current lubrication order) if needed. Check system for leaks.

(7) Check the carrier transmission fluid level. Add fluid specified in the current lubrication order if necessary.

See paragraphs 4-39 (crane) and 8-12 (carrier).

(9) Refer to the current lubrication order to lubricate both carrier and crane as specified.

(10) Check tire pressure and add air if required to obtain 75 psi.

(11) Check the carrier air system for damaged lines. Insure that air reservoirs drain cocks are closed and plugs from the safety valves (located near the reservoirs) are removed.

(12) Install the boom and cables as described in paragraph 4-2.

(13) Make a final complete inspection of the crane and carrier. Look for leaks, loose or broken wiring connections, broken or damaged tube fittings, and any other damage or unsafe conditions.

(14) Have an operator who has completed familiarization with the operating instructions contained in chapter 2, start and operate the equipment. Check all controls and operations. Refer to the appropriate sections in this chapter for repair instructions required. Report to direct support maintenance personnel any damage that need repair and are not covered in this manual.

4-2 Installation

a. General. The carrier/crane may have been shipped without the boom attached. If so it will be necessary to install the boom, backstop, spreader gantry, cables and hook block. If the unit has been air transported it will also be necessary to raise the crane cab and install the cab door.

b. Crane Cab Installation. Refer to figure 4-2. Install the canopy panel, windshield and cables as follows:

(1) Slide the windshield in place and secure using the wing nut locks located around the windshield frame.

(2) Place the canopy panel on top of the carrier and secure in place using the tension locks mounted on the inside of the cab.

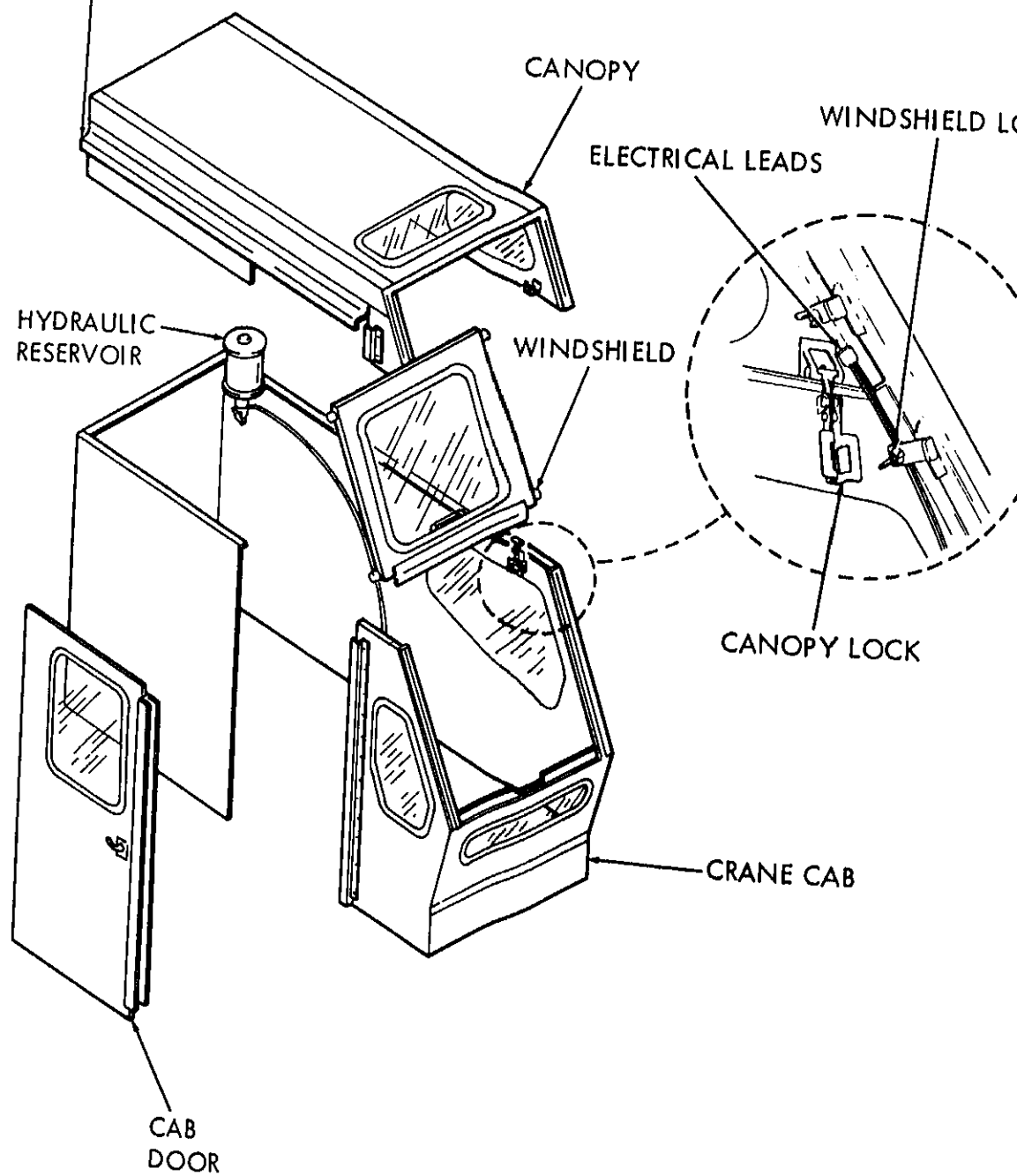
(3) Slide the door into the groove on the carrier and push the door forward to close.

(4) Connect electrical leads and mount hydraulic reservoir.

c. Crane Boom Installation.

(1) Secure the two boom sections together.

DOOR GROOVE



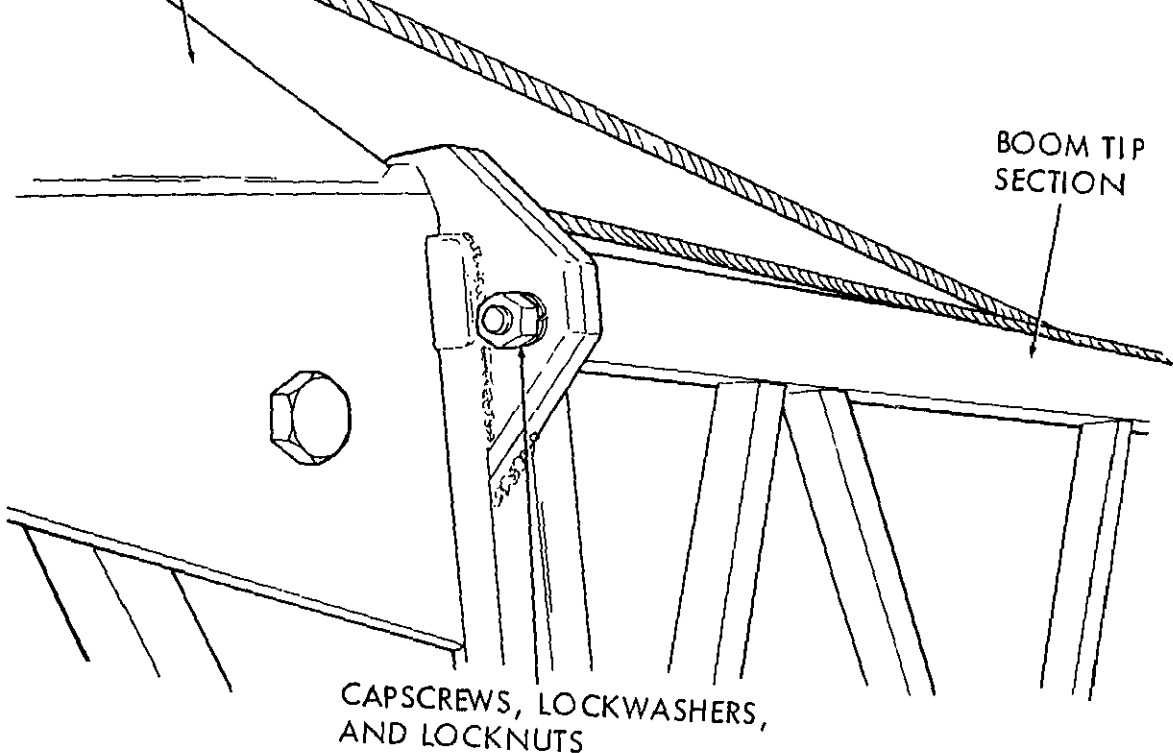
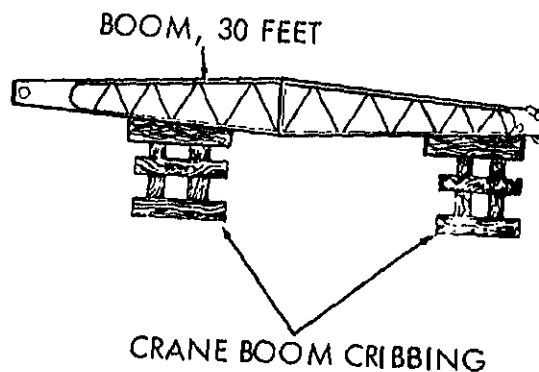
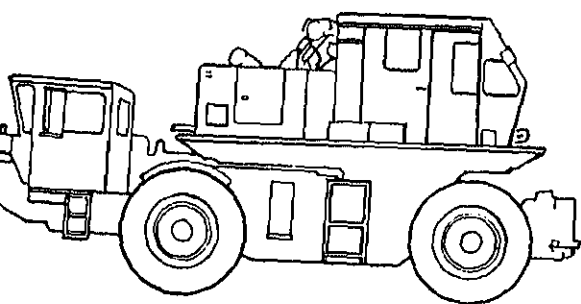


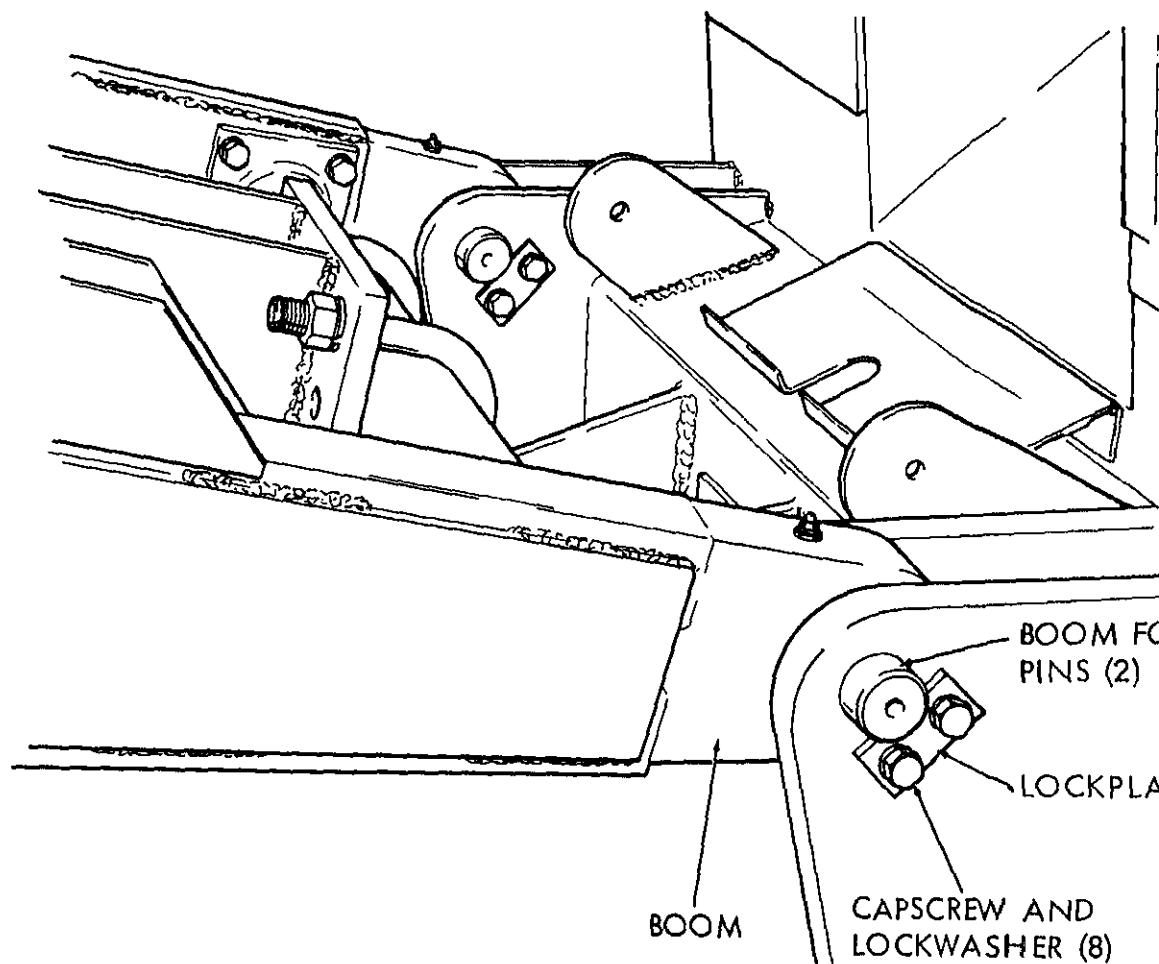
Figure 4-2. Boom section attachment.

(TA032)



WARNING: MAKE SURE CRIBBING IS SET ON FIRM GROUND TO AVOID UPSETTING OF BOOM, CAUSING INJURY TO PERSONNEL AND DAMAGE TO ATTACHMENT.

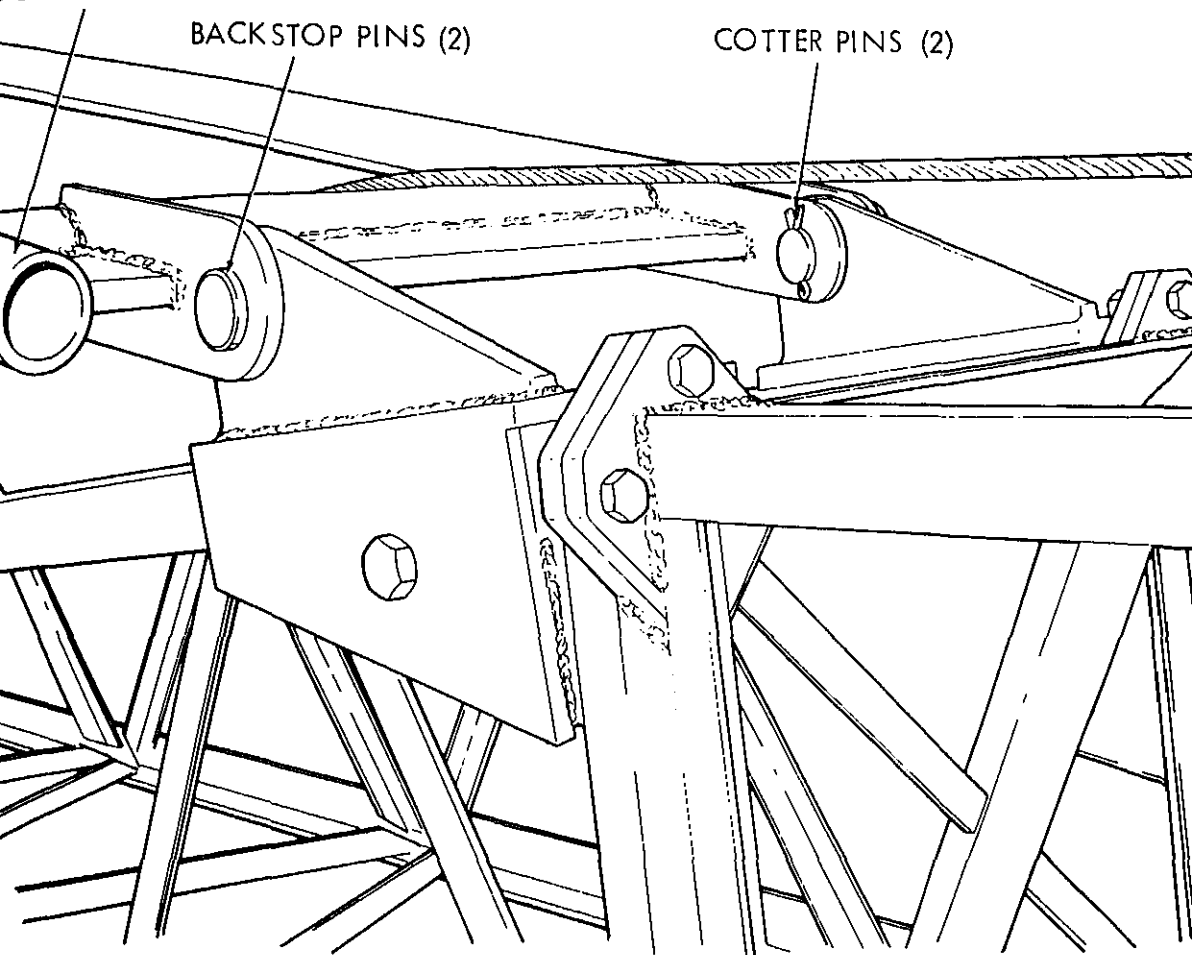
- STEP 1. INSTALL BOOM FOOT PINS.
STEP 2. INSTALL LOCKPLATES IN PIN SLOTS.
STEP 3. INSTALL CAPSCREWS AND LOCKWASHERS.



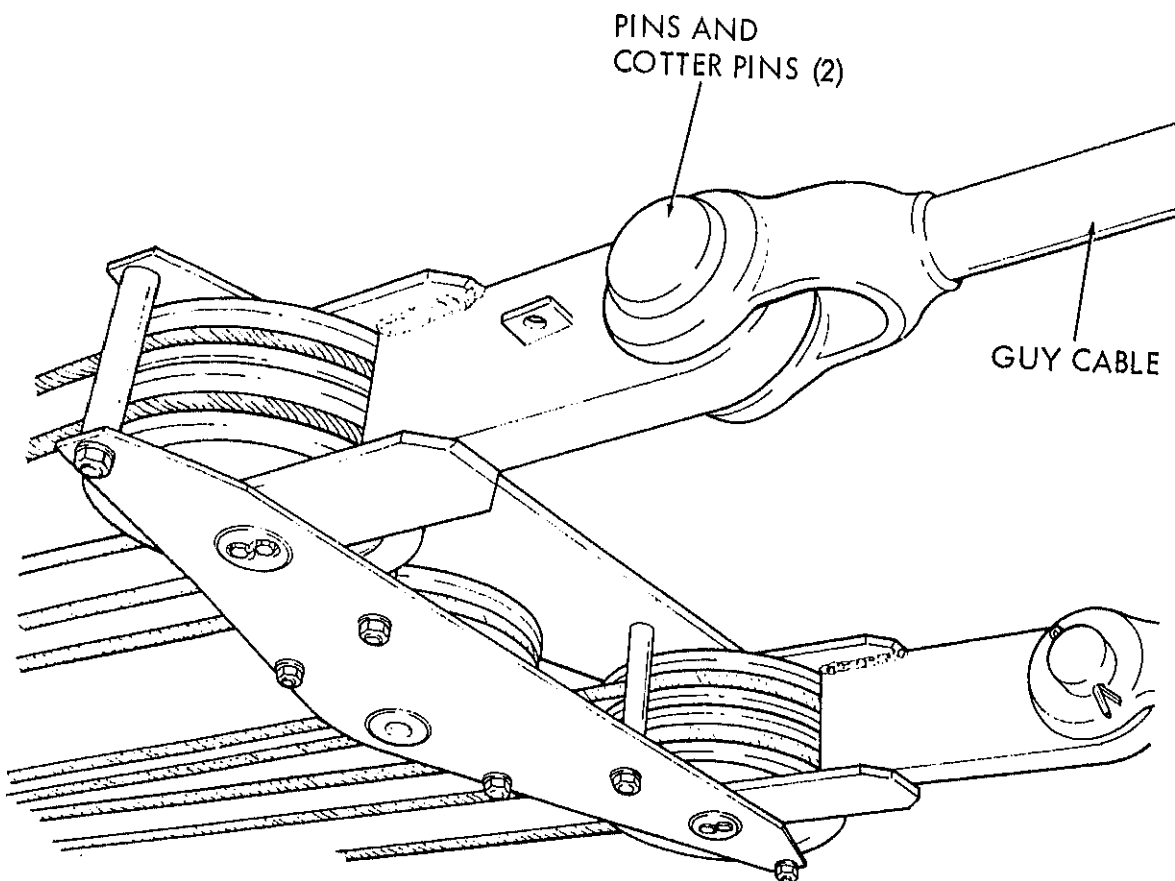
BOOM BACKSTOP

BACKSTOP PINS (2)

COTTER PINS (2)



- STEP 1. PLACE BOOM BACKSTOP ON BOOM AS SHOWN.
STEP 2. INSTALL BACKSTOP PINS.
STEP 3. INSTALL COTTER PINS.

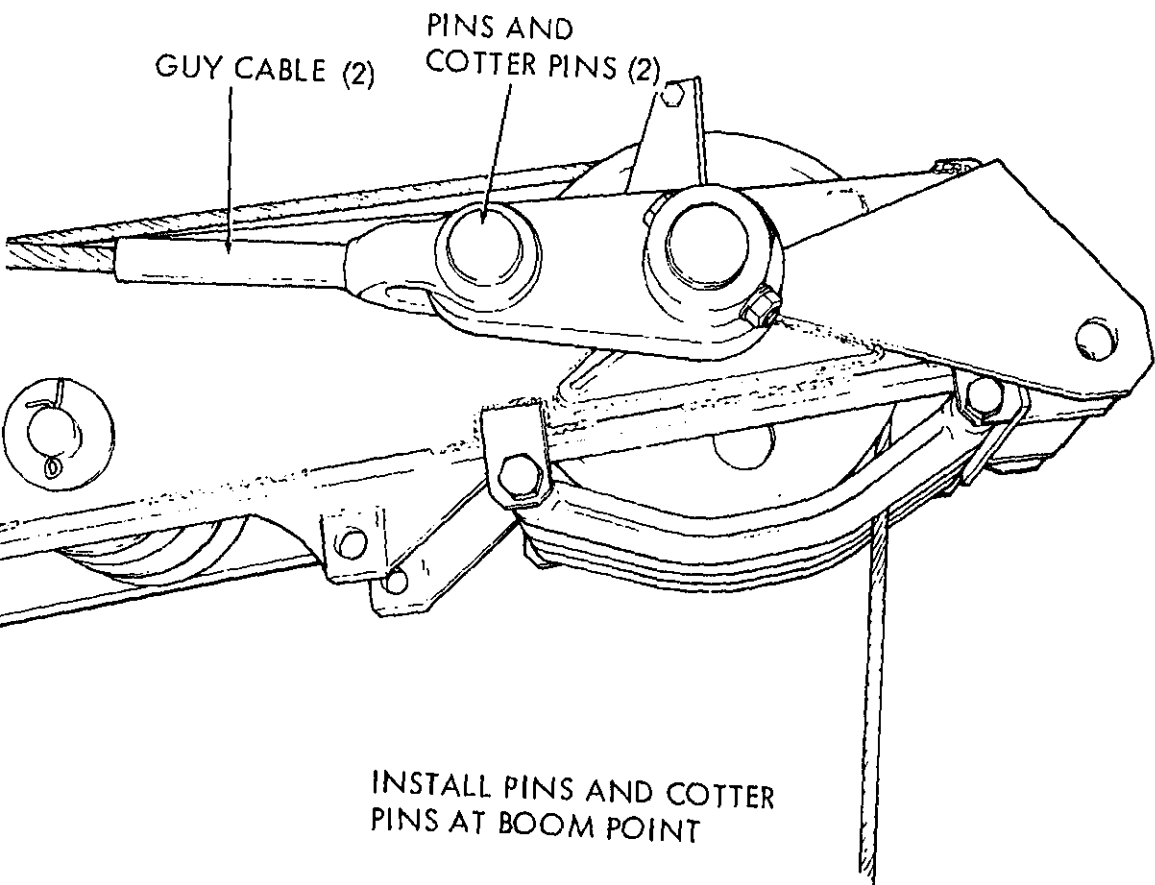


INSTALL PINS AND COTTER PINS AT UPPER SPREADER

(TA0325)

Figure 4-6. Guy cables, gantry to upper spreader, installation.

(2) Install guy lines between upper spreader and boom point with pins and cotter pins as shown figure 4-7.



(TA032879)

Figure 4-7. Guy cables, upper spreader to boom point, installation.

Moist Cable Reeving.

CAUTION

absolutely sure that there are no loops in the cables as they are un-

WARNING

boom.

(2) Refer to figure 4-8 and reeve cable. Reeve one end of the cable around the left side of the center upper spreader sheave, around the top left gantry sheave, around the top left upper

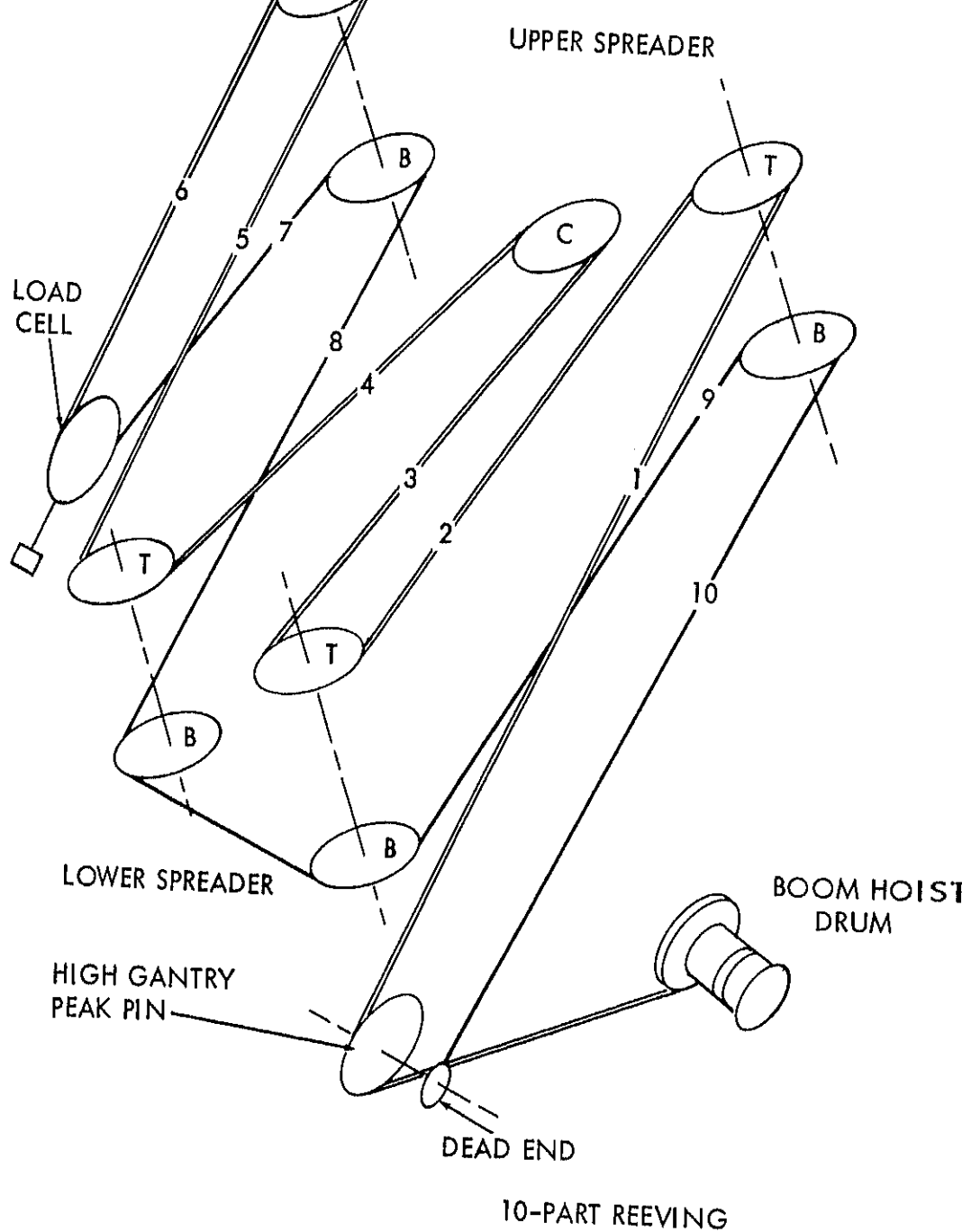


Figure 4-8. Boom hoist line reeving.

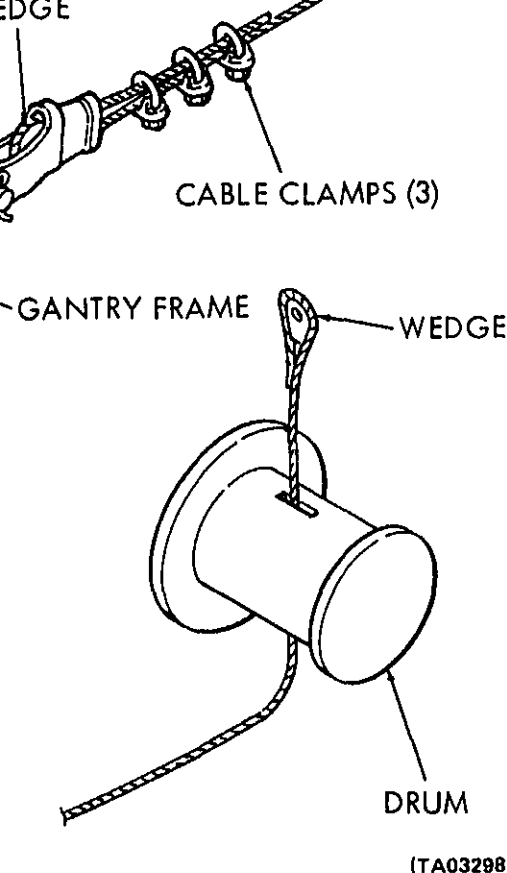


Figure 4-9. Securing cable to drum, and gantry.

in Hoist Line Reeving.

Main hoist line reeving is shown in figure 4-10. The number of parts of line (from one to five)

within the limitations shown on the rating plate, is used to secure the machine crane cab.

(2) Reeve the main hoist line to the main drum and secure cable as shown in figure 4-9.

(3) A single-part line is reeved over the center boom point sheave, directly to a weighted hook, and is dead-ended at the hook. A weighted hook must be used for single line operation, instead of a hook block.

(4) A two-part line is reeved over the center boom point sheave, around one hook block sheave, and is dead-ended at the boom point.

(5) A three-part line is reeved over the left boom point sheave, around a hook block sheave, around the right boom point sheave, and dead-ended at the hook block.

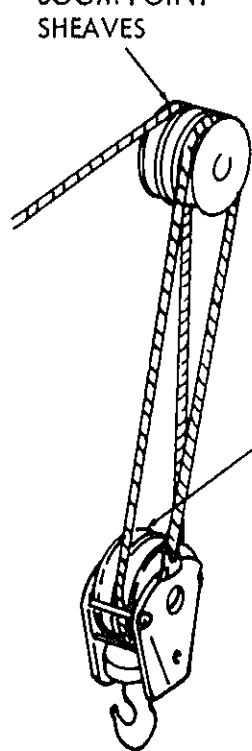
(6) A four-part line is reeved over the left boom point sheave, around the left hook block sheave, around the right boom point sheave, around the right hook block sheave, and dead-ended at the boom point.

(7) A five-part line is reeved over the left boom point sheave, around the left hook block sheave, around the center boom point sheave, around the right hook block sheave, around the right boom point sheave, and dead-ended at the hook block.

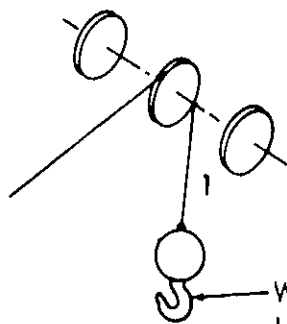
(8) Operate main drum slowly and guide cable so that it is distributed evenly on drum.

h. Angle Indicator. Position the boom angle indicator and secure with four cap screws, lockwashers, and nuts as shown in figure 4-11.

i. Angle Transducer. The angle transducer must be installed by direct and general support maintenance personnel.



HOOK BLOCK
SHEAVES



WEIGHTED
HOOK

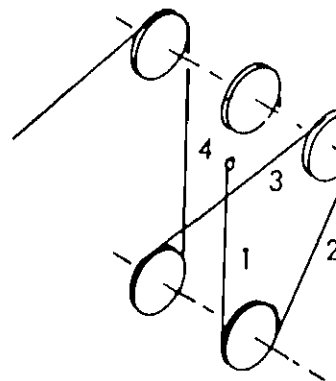
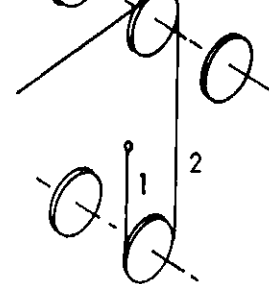
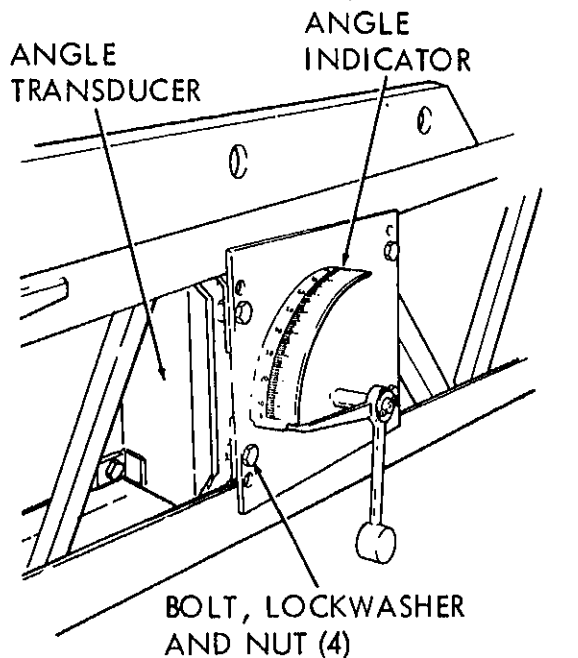


Figure 4-10. Main hoist line reeving.

BE INSTALLED BY DIRECTOR
GENERAL SUPPORT MAIN-
TENANCE PERSONNEL.

- STEP 1. POSITION BOOM ANGLE
INDICATOR AS SHOWN.
- STEP 2. SECURE IN PLACE WITH BOLTS,
LOCKWASHERS, AND NUTS.



(TA032983)

Figure 4-11. Crane boom angle indicator.

Section II. MOVEMENT TO A NEW WORKSITE

General

This section will describe how to prepare the unit for movement to a new worksite. The carrier/crane can be driven under its own power, depending on road conditions and distance. The unit can also be fully dismantled to allow for air shipment.

Dismantling for Movement

Outrigger and Float Pad. Store outrigger and float pads as follows:

- 1) Retract hydraulic outrigger.
- 2) Remove and store float pads.

Utility Blade. Lock up utility blade as follows:

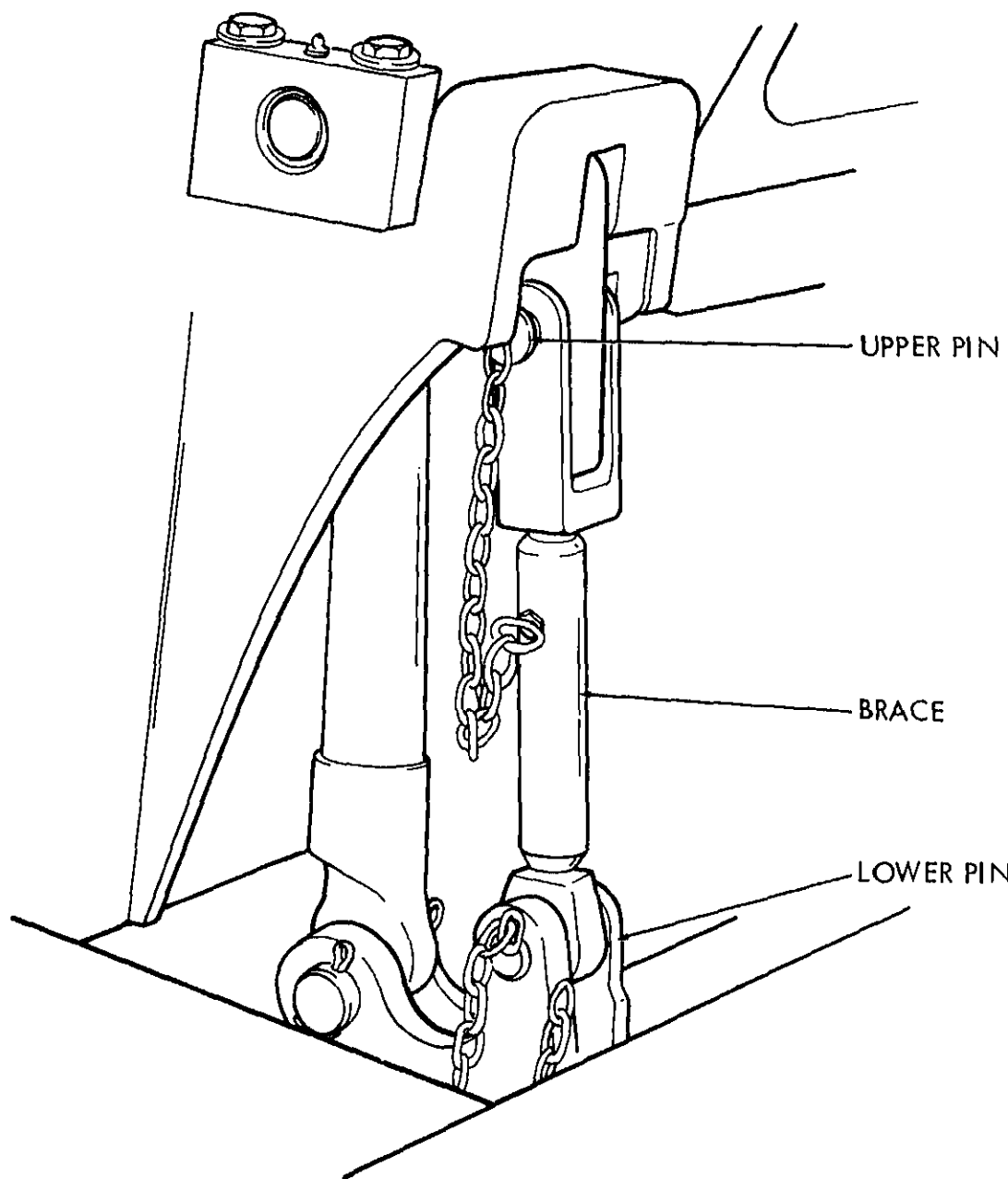
- (1) Swing the crane until the boom extends the boom cradle. See figure 4-13. Engage the lock as shown in figure 4-14.

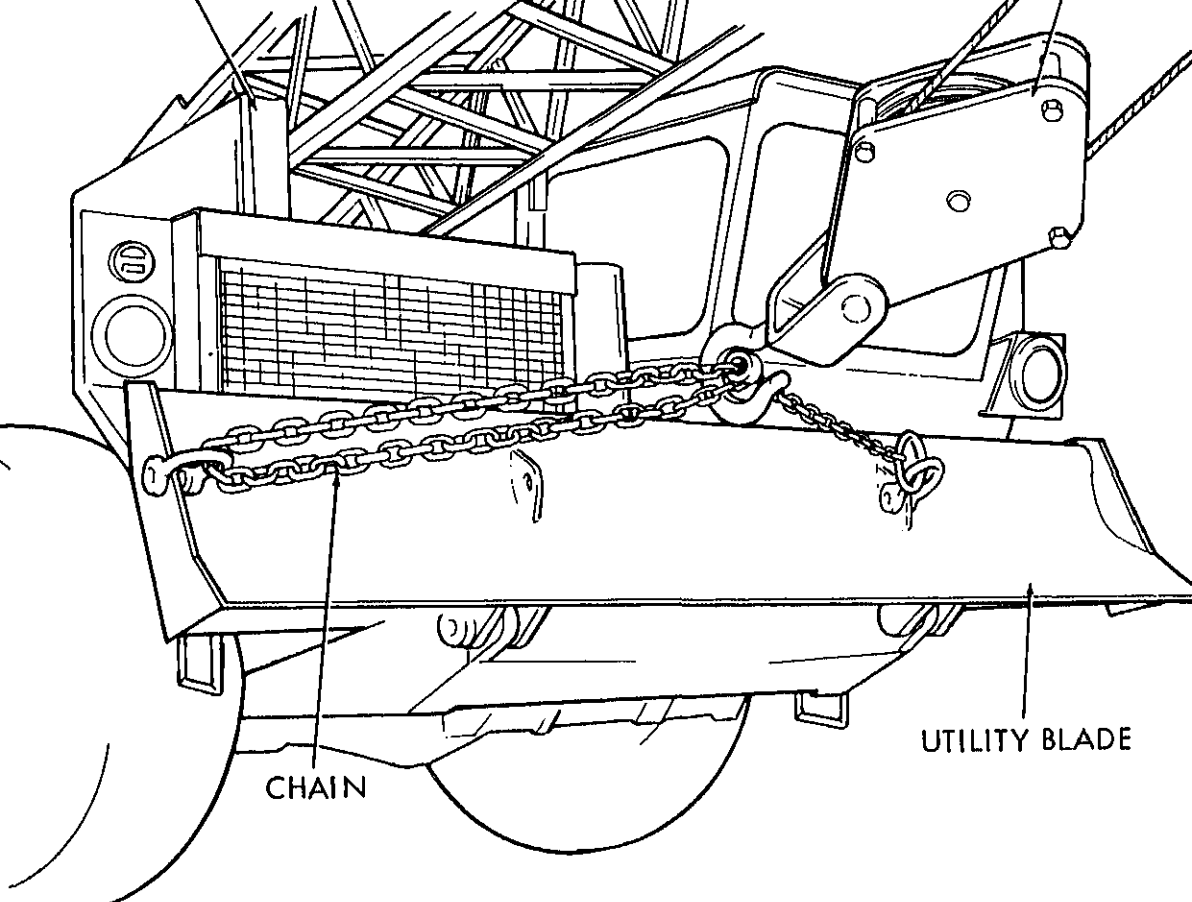
CAUTION

Do not allow boom to rest on boom cradle at any time as the weight of the boom could cause damage to the carrier radiator assembly.

- (2) Lower boom into the boom cradle to eight inches from resting on cradle.

- (3) Using a chain secure the boom load cable hook block to the utility blade as shown in figure 4-15. Take up slack on load cable and set drum brake. See figure 4-16, *Crane Boom (Air Shipment)*. If the unit is





(TA0325

Figure 4-13. Boom secured to blade.

2) Build up cribbing as shown in figure 4-3 and boom to rest on blocks. Insure boom is safely oned on cribbing and cribbing is securely ced on the ground.

3) To remove load and boom hoist cables letely refer to paragraph 4-2 for appropriate uctions. If the cables do not have to be letely removed follow instructions in sub-graphs (4 and 5) below.

4) Carefully remove and pack load cell. Operate drum slowly to take in load cable. Secure end of to drum with wire or rope.

5) Remove the hook block and stow for ment. Operate load cable drum and take in load . Secure dead-end of cable to drum with wire or

Remove cotter pins and foot pins. Drive carrier from cribbed up boom. Reinstall the foot p prevent loss during shipment.

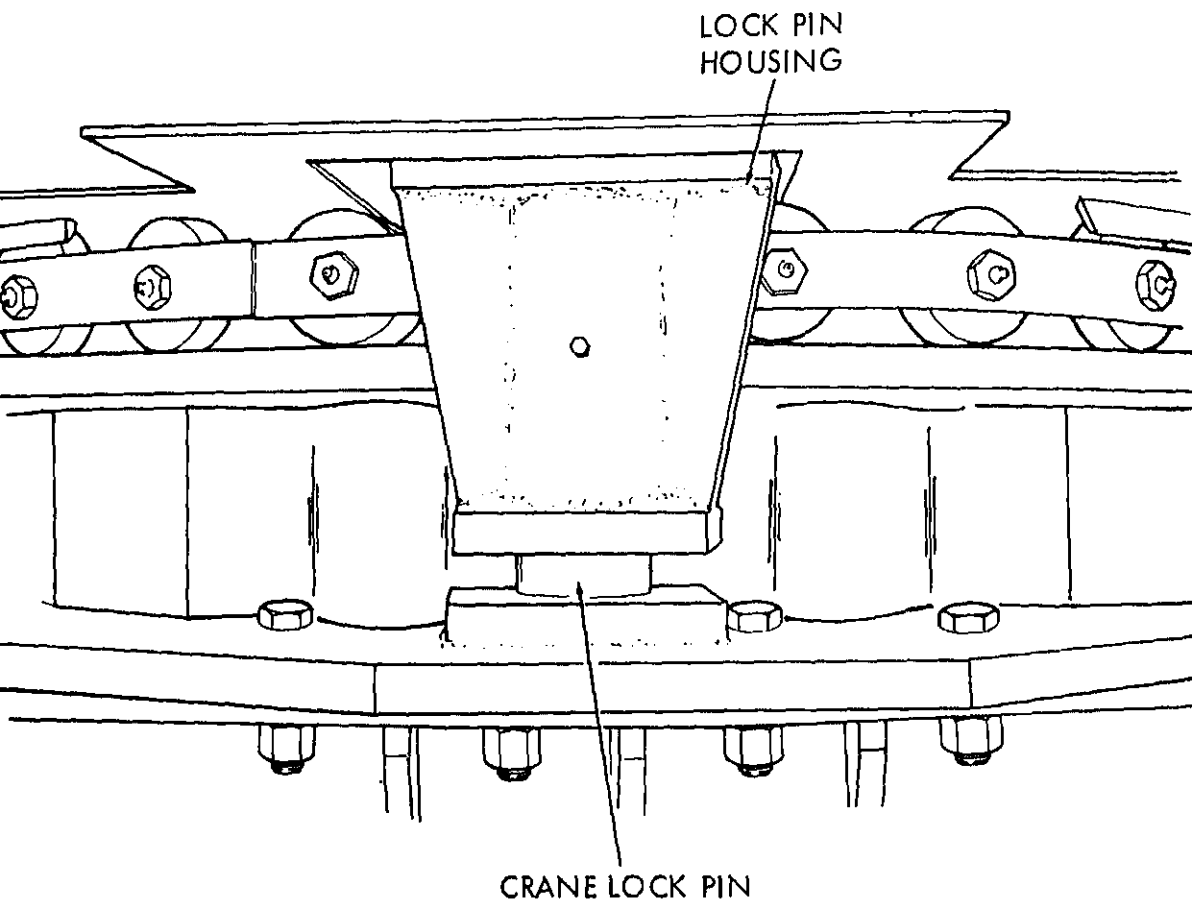
(8) If necessary for shipment, separate the boom sections by removing the capscrews and shown in figure 4-2.

e. Crane Cab. For air shipment it may be nec to remove the upper cab structure for clea Proceed as follows:

(1) Slide cab door back and off of the roller

(2) Unlock the tension latches shown in fig and remove the canopy.

(3) Loosen the windshield lock nuts and r the windshield. Tighten the lock nuts enough : they will not become loose and get lost



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Figure 4-14. Swing lock engaged.

moved for shipment.

(2) Identify and tag parts that may be confused with like parts upon arrival of unit at a new worksite.

(3) Reinstall and securely tighten all attaching hardware to prevent their loss during shipment.

4-5. Reinstallation After Movement

Refer to paragraph 4-2 for installation instructions after movement to a new worksite.

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

6. Tools and Equipment

Tools, equipment and repair parts issued with and authorized for the M200DT are listed in the

4-7. Special Tools and Equipment

There are no special tools or test equipment re-

Section IV. LUBRICATION INSTRUCTIONS

General

This section contains lubrication instructions which are only supplemental to those instructions contained in lubrication orders LO5-3810-295-12-1, -2 and -3.

Detailed Lubrication Information

General. Keep all lubricants in closed containers and store in a clean, dry place, away from external heat. It is important to insure that no dust, dirt or foreign material mixes with lubricants. Keep lubrication equipment clean and ready for use.

Cleaning. Keep all external parts not requiring lubrication free of lubricant. Before lubricating the

equipment, wipe lubrication fitting with a clean rag to remove any accumulation of grease and dirt. Clean each lubrication point after lubricating to prevent accumulation of grease and dirt.

CAUTION

Overlubrication may cause equipment failure or damage to working parts.

c. *Lubrication.* Lubricate the equipment as instructed and detailed in LO5-3810-295-12.

d. The crankcase oil level must be checked frequently, as oil consumption may increase.

e. The oil may require changing more frequently than under warm weather conditions because of contamination by dilution and sludge formation.

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

General

This section contains a table that will aid in systematically performing preventive maintenance checks and services on the M320RT crane. The checks to be performed are listed in table 4-1. Preventive maintenance is performed so that defects are found before they result in malfunction or damage to the equipment and to prevent possible injury to personnel working with or around the equipment.

WARNING

Stop equipment immediately if a defect is found that could result in damage to equipment or injury to personnel.

4-12. Preventive Maintenance Checks and Services

Table 4-1 contains the checks and services to be performed by organizational personnel on a regular basis. The checks and services are presented in a manner that will enable more than one person to work on the equipment without getting in each other's way. The last column in the table provides the time (in tenths of hours) it should take to accomplish each check or service procedure. All deficiencies, whether discovered during operation or during preventive maintenance, will be recorded in DA Form 38-750. This shall be done at the earliest possible opportunity.

Table 4-1. Organizational Preventive Maintenance Checks and Services

Quarterly
man-hours required:

| e | Item to be Inspected Procedure | W Time |
|---|---|-----------|
| | FUEL TANK Check level — keep tank full. Check tank and connections for leaks. | 0.1 |

Clean terminal posts and cable connectors. Inspect for three-eighths of an inch above plates or to marker on case. In freezing weather run engine for one hour after adding water.

Test specific gravity of battery solution and recharge or replace as required (see paragraph 4-49).

ENGINE OIL

Check quality and quantity of oil. Add or change oil if necessary. Refer to paragraph 4-22.

OIL FILTER

Check for leaks. If engine oil appears dirty, change filter as described in paragraph 4-22.

DRIVE BELTS

Check for proper deflection and condition. Adjust or replace if necessary.

HYDRAULIC FLUID RESERVOIR

Check fluid and add, if necessary, as specified in LO5-3810-295-12. Every six months change hydraulic fluid.

LIGHTS

Check wiring and connections. Repair, if necessary, as described in paragraph 4-44. Check bulbs, replace if necessary.

FIRE EXTINGUISHER

Check seal. Replace or recharge unit if seal is broken.

RAIN SHUTTERS

Open before starting engine. Close after stopping engine. Lubricate with OE lubricant and oil can.

ROLLER CIRCLE ASSEMBLY

Inspect the roller circle for damage. Adjust or replace, if required, as described in paragraph 4-73.

CAB ASSEMBLY

Inspect cab for damage. Straighten out any bent or damaged sheet metal. Replace any cracked or broken glass.

MASTER CYLINDERS

Check hydraulic fluid level in cylinders. Replenish if necessary as described in LO5-3810-295-12. Refer to paragraph 4-67 if brake lines require bleeding.

HYDRAULIC LINES

Check hydraulic lines for leaks and damaged fittings. Repair or replace as described in paragraph 4-67.

BOOM

Check boom for structural damage such as cracks or broken welds.

UPPER SPREADER

Check upper spreader for damage. Pay particular attention to the sheaves. Replace damaged sheaves.

GANTRY

Inspect for cracks, damaged sheaves and lack of lubricant. Repair or replace sheaves as described in paragraph 4-66.

Lubricate in accordance with LO5-3810-295-12.

CABLES

Inspect for frays, breaks, or wear. Replace damaged cables as described in paragraph 4-65. Inspect cable clamps at dead end tighten or replace if necessary.

HOOK BLOCK

Inspect for cracks, damage or damaged rollers. Replace hook block as described in paragraph 4-63.

BOOM AND HOIST BRAKE BAND

Check operation and adjust if necessary as described in paragraph 3-23. If lining is worn to within one-sixteenth of an inch of rivet heads, replace as described in paragraph 4-70.

DRUM CLUTCHES

Check operation and adjust if necessary. If linings are worn to within one-sixteenth of an inch at rivets head, refer the equipment to direct and general support maintenance for lining replacement.

CONTROL AND LEVERS

While crane is running, operate all controls and levers. Refer to the appropriate repair

GAUGES

While crane engine is running observe all gauges for the following normal readings:

| | |
|------------------------|---------------------|
| Coolant temperature | 180° to 200°F. |
| Engine oil pressure | 45 psi (max) |
| Engine oil temperature | 220°F. |
| Voltmeter | See paragraph 2-2b. |
| Tachometer | 2400 rpm (max) |

Section VI. TROUBLESHOOTING

General

This section provides information useful in finding, isolating and correcting unsatisfactory operation of the crane and its components.

Troubles isolated that are beyond the repair abilities of organizational maintenance shall be referred to direct and general support maintenance.

4-14. Troubleshooting Chart

The troubleshooting chart, Table 4-3, lists possible malfunctions, tests or inspection to determine cause of malfunction and corrective actions to be taken. Perform the tests/inspections and corrective actions in the order that they are listed.

Table 4-2. Troubleshooting Chart

FUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

ENGINE WILL NOT CRANK

- Step 1. Check to see if battery is discharged and electrolyte level is low.
Fill battery cell to three-fourths of an inch above baffle plates. Recharge battery.
- Step 2. Check battery cables and ignition wiring for breaks, loose connections or corrosion.
Clean battery terminals. Replace damaged battery cables. Replace or repair damaged ignition wiring.
- Step 3. Check to see if starter relay is engaging flywheel when starter button is depressed.
spinning or clicking sound indicates a faulty relay.
Replace starter relay as described in paragraph 4-40.

ENGINE CRANKS, BUT TOO SLOW TO START

- Step 1. Check battery for insufficient charge.
Recharge battery as described in paragraph 3-15.
- Step 2. Loose battery or starter cable connections.
Tighten or replace cable connections.

ENGINE CRANKS, BUT DOES NOT START

- Step 1. Check fuel tank level.
Refill fuel tank.
- Step 2. Check air cleaner and air intake lines for damage, clogging or obstructions.
Clean lines and service air cleaner as described in paragraph 3-11.
- Step 3. Check fuel filter for dirty element or clogged lines.
Service fuel filter as described in paragraph 3-8.
- Step 4. Check fuel pump, and injector for faulty operation.
To repair fuel pump and injectors refer defects to direct and general support maintenance personnel.
- Step 5. In cold weather check the cold weather starting aid for proper operation.
Replace damaged cable controls. Clean clogged lines and replace faulty controls.

4. ENGINE OVERHEATS

Step 1. Check coolant level.

Add water to radiator if level is low. Determine cause of low coolant level or service. (See steps 2 through 4.)

Step 2. Check fan and water pump V-belt tension.

Adjust V-belt tension as described in paragraph 4-39.

Step 3. Check radiator and coolant, as coolant may be excessively dirty and radiator clogged.

Drain and flush radiator as described in paragraph 3-11.

Step 4. Check hoses for leaks or a collapsed condition.

Replace damaged hoses (see paragraph 4-37).

Step 5. Remove and test the thermostat as described in paragraph 4-36.

Replace defective thermostat.

Step 6. Remove and check water pump for damaged parts or a defective impeller.

Replace defective pump.

5. ENGINE FAILS TO REACH OPERATING TEMPERATURE

Step 1. Thermostat may be stuck open or removed from vehicle. Remove thermostat and check thermostat.

Replace defective thermostat (see paragraph 4-36).

Step 2. Check for excessive leakage at the thermostat seals.

Replace thermostat seals, as described in paragraph 4-36.

6. LOW OIL PRESSURE

Step 1. Check for leaks in oil lines.

Replace damaged parts and/or tighten loose connections.

Step 2. Check quality of oil. If oil is dirty, oil filter may be clogged.

Drain oil and change filter as described in paragraph

Step 3. Check oil viscosity. If oil is too thin it will cause low oil pressure.

Refer to L05-3810-295-12 for proper grade of oil. Drain and refill crankcase with correct oil as described in paragraph

7. HIGH OIL PRESSURE

Step 1. Check oil viscosity. If oil is too thick it will cause high oil pressure.

Refer to L05-3810-295-12-1.

Step 2. Check for defective oil gage by connecting an external test gage or by replacing dash panel.

Replace defective gage as described in paragraph 4-43.

8. BATTERIES DISCHARGE WITH ENGINE RUNNING

Step 1. Check electrical connections for loose or broken wires.

Repair broken wires, tighten loose connections.

Step 2. Check to see if alternator V-belt is loose or broken.

Adjust V-belt tension if loose. Replace broken belt.

Step 3. Check to see if alternator brushes are excessively worn.

Replace worn brushes.

Step 4. Check to see if alternator is charging with proper voltage applied.

Replace a defective alternator.

9. EXCESSIVE OIL CONSUMPTION

Step 1. Check all oil lines, filter and oil pan for oil leaks.

Replace defective oil lines, tighten loose connections. Refer leaking oil to support maintenance.

Refer to direct support maintenance for tappet adjustment.

Step 2. Check to see if proper fuel is being used.

Fill fuel tank with proper fuel.

Step 3. Check to see if connecting rod bearings or main bearings are damaged.

Report condition to direct support maintenance for repair.

ROUGH OR ERRATIC ENGINE IDLING

Step 1. Check to see if intake manifolds is leaking.

Refer to direct support maintenance for defective manifold replacement.

Step 2. Check to see if air cleaner is dirty.

Clean dirty air cleaner.

ENGINE STALLS INTERMITTENTLY AT FULL LOADS

Step 1. Check to see if air cleaner is dirty.

Clean dirty air cleaner.

Step 2. Check to see if fuel filters are dirty.

Replace dirty fuel filter elements.

Step 3. Check to see if fuel pump is faulty.

Replace faulty fuel pump.

ENGINE "CUTS OUT" SUDDENLY

Step 1. Check all fuel lines for restriction.

Replace defective fuel line.

Step 2. Check fuel and fuel tank for dirt.

Drain and refill fuel tank with clean fuel.

Step 3. Check to see if fuel pump is faulty.

Replace defective fuel pump.

LIGHTS FAIL

Step 1. Check for burned out lamps.

Replace defective lamps (see paragraph 4-43).

Step 2. Break in wiring.

Splice or replace defective wiring (see paragraph 4-44).

Step 3. Check for defective switch.

Replace damaged switch (see paragraph 4-43).

EVOLVING FRAME WILL NOT SWING

Step 1. See if swing lock is engaged.

Disengage swing lock.

Step 2. See if swing brake is engaged.

Disengage swing brake.

Step 3. Check swing clutch adjustment.

Adjust swing clutch as described in paragraph 3-24.

CRANE WILL NOT LIFT RATED CAPACITY

Step 1. Check drum clutch adjustment.

Adjust clutch as described in paragraph 3-22.

Step 2. Check hydraulic system fluid level.

Add fluid and bleed system as required.

BOOM WILL NOT RAISE

Step 1. Check boom hoist clutch adjustment.

Adjust boom hoist clutch as described in paragraph 3-23.

Step 2. Check hydraulic system fluid level.

Add fluid and bleed system as required.

18. BOOM WILL NOT LOWER

- Step 1. Check to see if boom hoist safety pawl is engaged or out of adjustment.
Disengage safety pawl or adjust as described in paragraph 4-75.
- Step 2. Check to see if boom hoist brake drum is out of adjustment.
Adjust as described in paragraph 3-23.

19. LEVER OR PEDAL OPERATION EXCESSIVE OR SPORATIC

- Step 1. Check lever or pedal adjustment.
Adjust lever or pedal as described in paragraph 3-28.
- Step 2. Check hydraulic system fluid level.
Add fluid and bleed system as required.

Section VII. RADIO INTERFERENCE SUPPRESSION

4-15. General

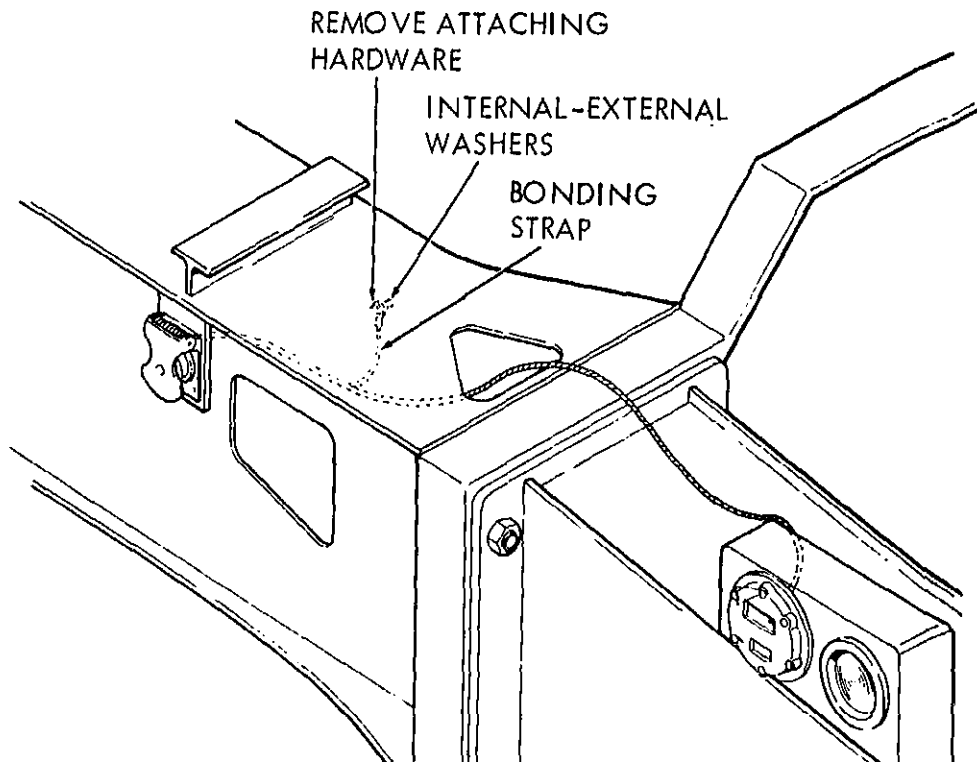
a. The term "radio interference" as used in this manual applies to those electrical disturbances in the radio frequency range, which are generated by the M320RT crane/carrier, and which may interfere with the proper operation of nearby radio receivers or other electronic equipment.

b. Essentially, suppression is attained by providing a low resistance path to ground for stray current.

The methods used include shielding the high frequency wires, grounding to the bonding straps and the use of capacitors and resistors in electrical circuits.

4-16. Radio Interference Suppression Components

Figure 4-15 illustrates the primary radio interference suppression components utilized on the M320RT truck crane.



as required. Replacement of components used as specific motors, fans and etc., are covered in the maintenance of the component.

Visual inspection of bonding straps and a mechanical check, insuring that external and internal washers are sufficiently tight to provide a good gasket connection.

Section VIII. MAINTENANCE OF THE ENGINE ASSEMBLY

General

This section covers the engine components and accessories and the applicable maintenance functions that are the responsibility of organizational maintenance.

Crane Engine

General. The crane engine provides power for the boom and hoist drums, rotating the crane and, through the alternate, DC current for the cranes electrical requirements.

b. Inspection. It is the responsibility of organizational maintenance personnel to inspect the engine assembly for oil, fuel and coolant leaks. Check tubes, hoses, connections and fittings. Inspect belts for frays or breaks. Inspect for any other signs of damage or excessive wear to the engine or accessories. Refer to the appropriate sections of this chapter for repair or replacement instructions. If appropriate instructions are not contained in this chapter report the malfunction or damage to the maintenance and general support maintenance personnel for correction.

Section IX. MAINTENANCE OF THE ENGINE LUBRICATION SYSTEM

General

The engine crankcase provides a reservoir for the lubricating oil. A drain plug is located on the bottom of the oil pan. The oil pump provides the pressure to keep oil at all internal engine parts, requiring lubrication, during engine operation. The oil cooler maintains proper oil operating temperature. Before the oil is pumped to the various engine parts, sludge and sediment is removed as it passes through the oil filter. A filler tube is provided for replenishing the oil and a dipstick for checking oil level. Gages and sending units indicate oil operating pressure and temperature to the operator.

Oil Filter

Fig. 4-16

NOTE

Always shutdown engine several minutes before checking oil level to allow oil in crankcase to return to crankcase.

Inspection and Service. Inspect and service the oil filter and system as follows:

If the oil filter appears excessively dirty, it should be changed as described in 4-22b

(2) Inspect oil lines and filter housing for cracks, leaks or other damage.

b. Removal. If the oil filter is to be removed, the oil filter should be changed. Change oil, remove and install new oil filter as follows:

NOTE

In cold ambient temperatures it is recommended that the engine be run for a while to warm oil before draining.

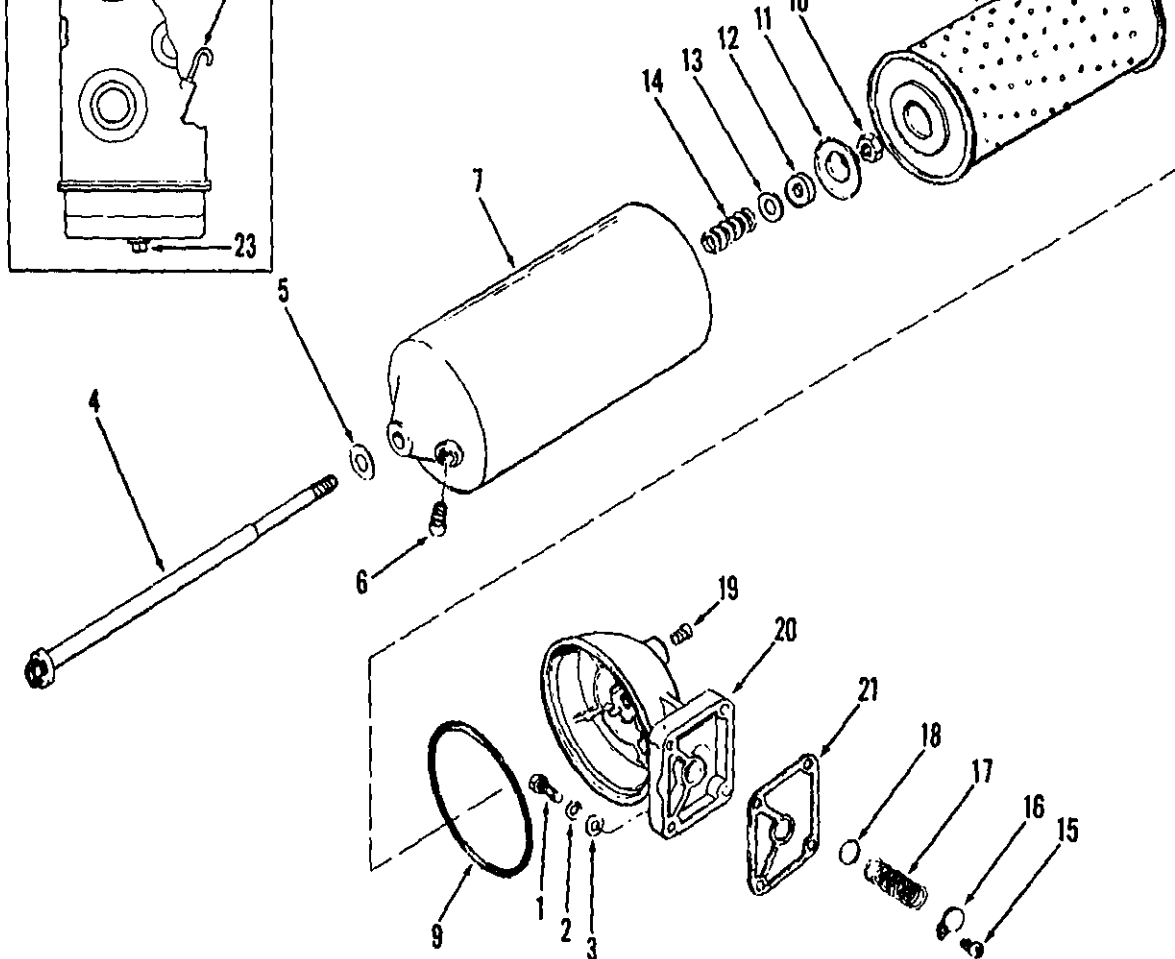
(1) Provide a suitable container, remove the drain plug (23) and drain oil. Allow oil to drain completely and reinstall drain plug.

(2) Remove drain plug (6) and drain oil from filter housing oil into a container of sufficient capacity.

(3) Remove four screws (1), washers (2) and lockwashers (3) to remove oil filter assembly.

c. Disassembly.

(1) Unscrew stud (4) and washer (5) to remove oil filter shell (7). Remove and discard element (8). Remove and discard gasket (9).



- 1 Capscrew
- 2 Washer
- 3 Lockwasher
- 4 Stud
- 5 Washer
- 6 Drain plug
- 7 Shell
- 8 Element
- 9 Gasket
- 10 Nut
- 11 Retainer
- 12 Gasket

- 13 Washer
- 14 Spring
- 15 Screw
- 16 Retainer
- 17 Spring
- 18 Valve
- 19 Pipe plug
- 20 Adapter
- 21 Gasket
- 22 Dipstick
- 23 Drain plug

Figure 4-16. Oil filter, exploded view.

d. Cleaning and Inspection.

(1) Clean all metallic parts with an approved cleaning solvent (Fed. Spec. P-D-680).

(2) Inspect springs for damage or loss of resiliency. Inspect all other parts for cracks or other signs of damage. Discard any damaged parts.

as follows:

(1) Insert stud (4) with washer (5) through (7). Install spring (14), washer (13), a new gasket (11) and secure with nut (10).

(2) Install plug (6) and replace element.

(1) Secure oil filter assembly to engine block with screws (1), washers (2) and lockwashers (3).

(2) Insure the oil pan drain plug has been

around oil pan drain plug and oil filter a Shutdown engine, wait a few minutes, and level. Replenish if necessary.

Section X. MAINTENANCE OF EXHAUST SYSTEM

3. General

The crane muffler is mounted on top of the crane engine compartment. It is shielded by a guard to protect operators and crews from burns.

4. Exhaust Pipes and Muffler

4-17

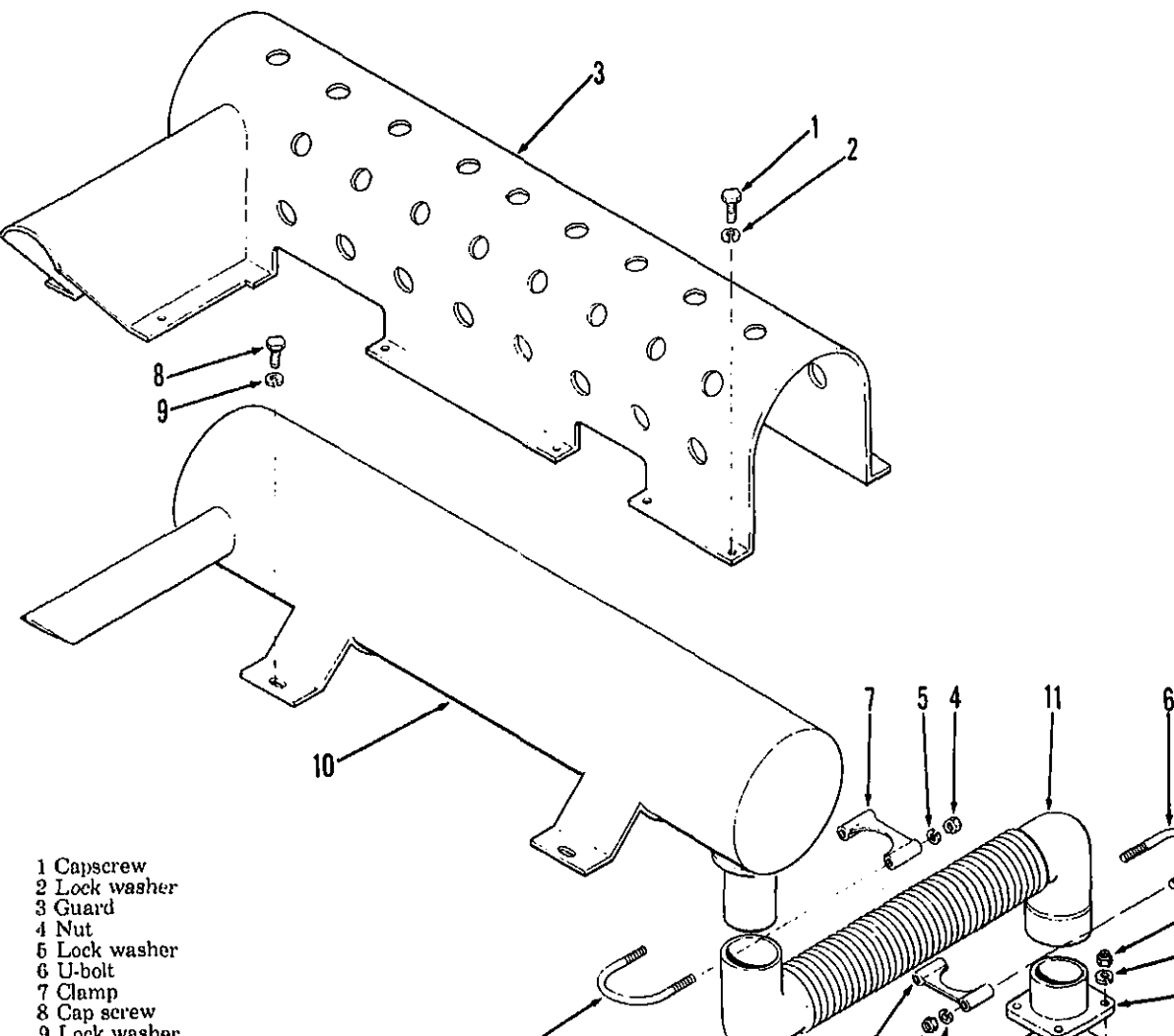
WARNING

Allow sufficient time after engine has been

shutdown for muffler and pipes to cool before attempting to work on exhaust system.

a. Removal. Refer to figure 4-17, and remove muffler and exhaust pipes as follows:

(1) Remove guard (3) by removing capscrews (1) and lock washers (2).



and clamps (7).

(3) Remove capscrews (8) and lock washers (9) to remove muffler (10) and exhaust pipe (11).

(4) If flange (14) or gasket (15) is damaged and needs to be replaced, do so by removing nuts (12) and lock washers (13). Remove any studs (16) that are damaged.

b. Inspection. Inspect all parts for breaks and cracks. Inspect muffler and pipe for holes or metal wear. Inspect clamps and mounting hardware for damage.

pipe as follows:

(1) Install any studs (16) that have been removed. Replace gasket (15) if it was removed. Secure flange (14) in place using nuts (12) and lock washers (13).

(2) Install muffler (10) and secure with capscrews (8) and lock washers (9). Install the exhaust pipe between muffler (10) and flange (14). Install clamps (6) and clamps (7) using nuts (4) and lock washers (5).

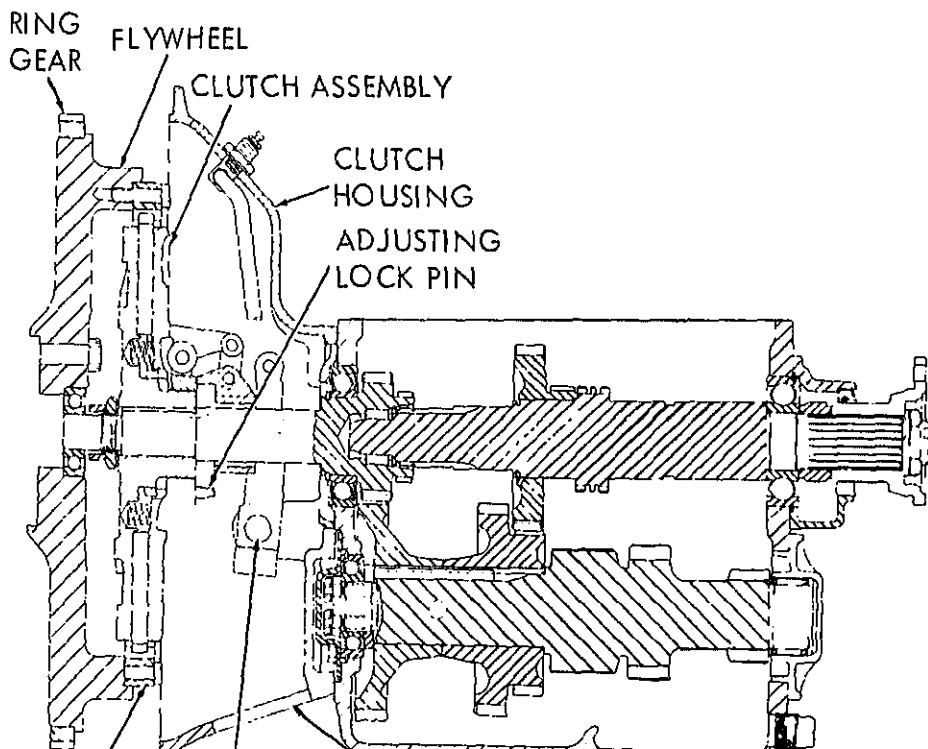
(3) Install guard (3) and secure in place with capscrews (1) and lock washers (2).

Section XI. MAINTENANCE OF ENGINE CLUTCH

-25. Engine Clutch Adjustment

a. General. The engine clutch assembly engages and disengages the drive torque from the engine to

the worm shaft. The clutch is controlled by a cable located in the operators cab (see fig. 4-18).



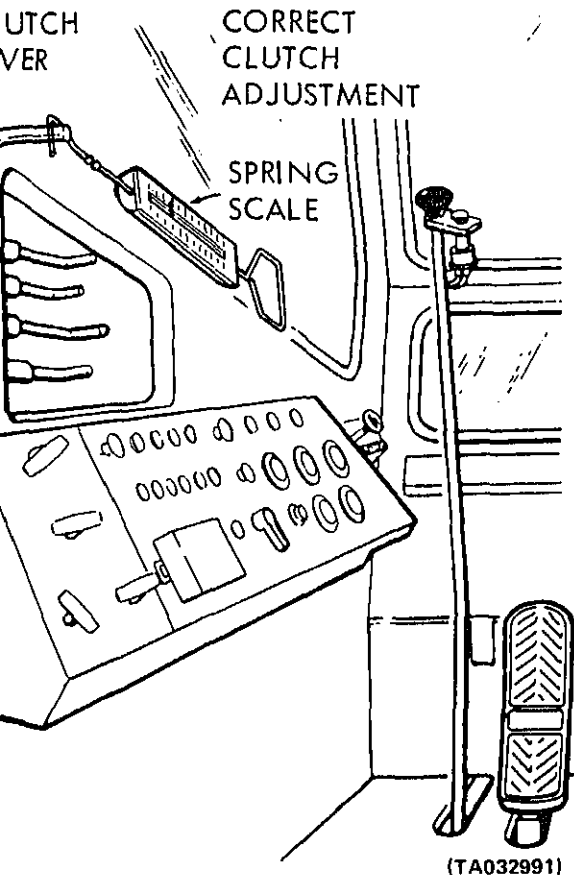


Figure 4-18. Engine clutch adjustment (sheet 2 of 2).

Section XII. MAINTENANCE OF THE FUEL SYSTEM

a. General

The fuel system consists of the fuel tank, injectors, manifolds, fuel pump, filter, strainer and tank. In addition there is a cold weather starting aid and a primer pump. The fuel pump draws fuel from the tank, through the filter and strainer and delivers under controlled pressure to the injectors. The injectors spray the correct amount of fuel into the combustion chambers.

WARNING

Always avoid smoking, creating sparks or working near open flame when servicing the fuel system.

b. Fuel Filter

(1) Disengage clutch lever.

(2) Remove hand hole cover and rotate shaft until adjusting lock pin can be reached through hand hole.

(3) Attach a pull-spring to clutch lever as shown in figure 4-18.

(4) Pull adjusting lock pin out and turn adjusting yoke to the right (clockwise) until it requires 40 lbs. pull on clutch lever to engage clutch.

(5) Continue to turn yoke, slowly, until the lock pin engages the next hole in the floating plate.

(6) Remove spring scale and reinstall hand hole cover.

gasket (9) and element (10).

(4) Remove retaining ring (12) and seal (13). Remove and discard seal (14). Remove seat (15) and spring (16).

(5) Further disassemble filter as shown in figure 4-19, only to the point required for replacement of damaged parts.

b. Cleaning and Inspection.

(1) Wash shell (11) with diesel fuel or an approved cleaning solvent and dry thoroughly. If cover appears excessively dirty or clogged remove cover and clean by flushing fuel through the fuel line ports.

(2) Inspect the shell (11) for cracks. Inspect the head (6) for damage or clogged ports. Inspect all parts for damage or excessive wear.

(5) To start engine it will probably be necessary use the hand priming pump located in the engine compartment.

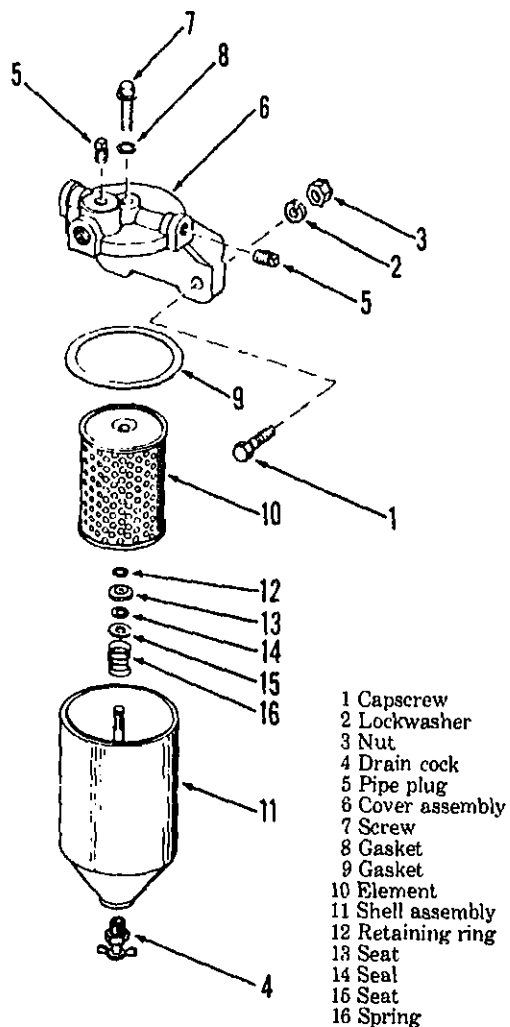
(6) Start engine and check for fuel leaks around er and connecting fuel lines.

shown in figure 4-20 only to the point require replace of damaged parts.

b. Cleaning and Inspection.

(1) Wash shell (12) and spring (11) with diesel fuel and dry thoroughly. If cover assembly (5) and element (10) are excessively dirty or clogged remove and clean by flushing fuel through the fuel line ports.

(2) Inspect shell (12) for cracks. Inspect cover assembly (5) for damage or clogged parts. Inspect other parts for damage or excessive wear.

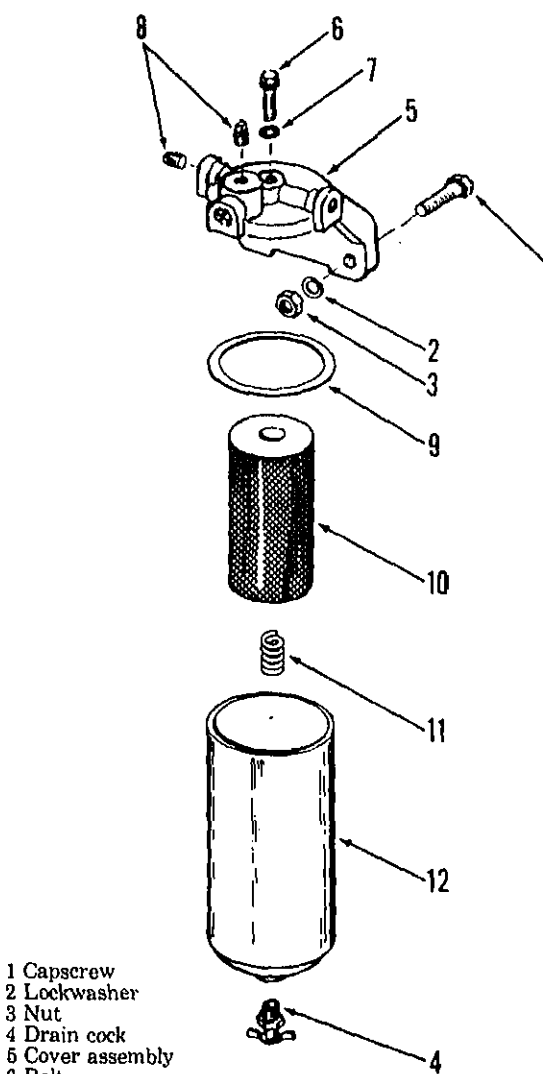


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Figure 4-19. Fuel filter assembly, exploded view.

28. Fuel Strainer

Fig. 4-20



2) Install spring (11) into shell (12) install a new gasket (10) and gasket (9). Use care to avoid **damaging** gasket (9) and screw shell onto cover assembly (5).

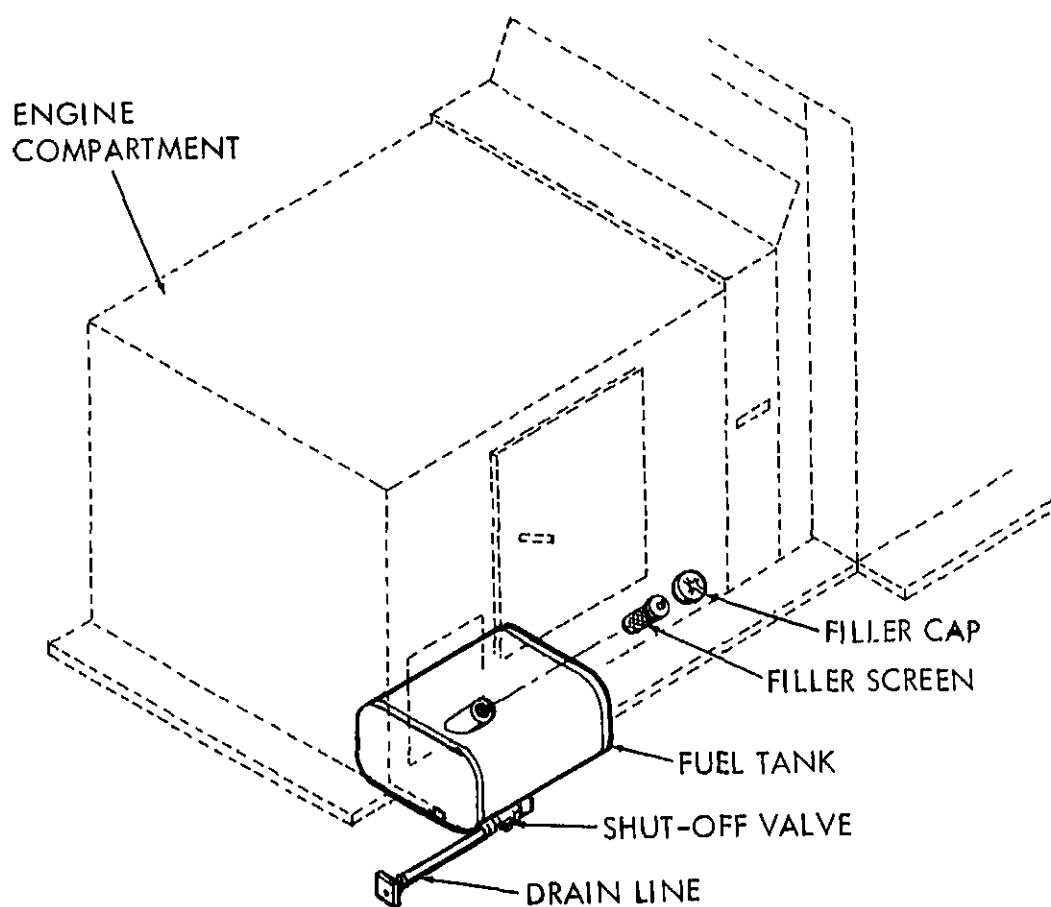
3) Reconnect the fuel lines to cover assembly and close drain cock (4).

4) To start engine it will probably be necessary to use the hand priming pump located just ahead of the fuel strainer. Start engine and check for fuel around strainer and connecting fuel lines.

fuel be used. Keeping the tank full as much as possible will help eliminate water condensation.

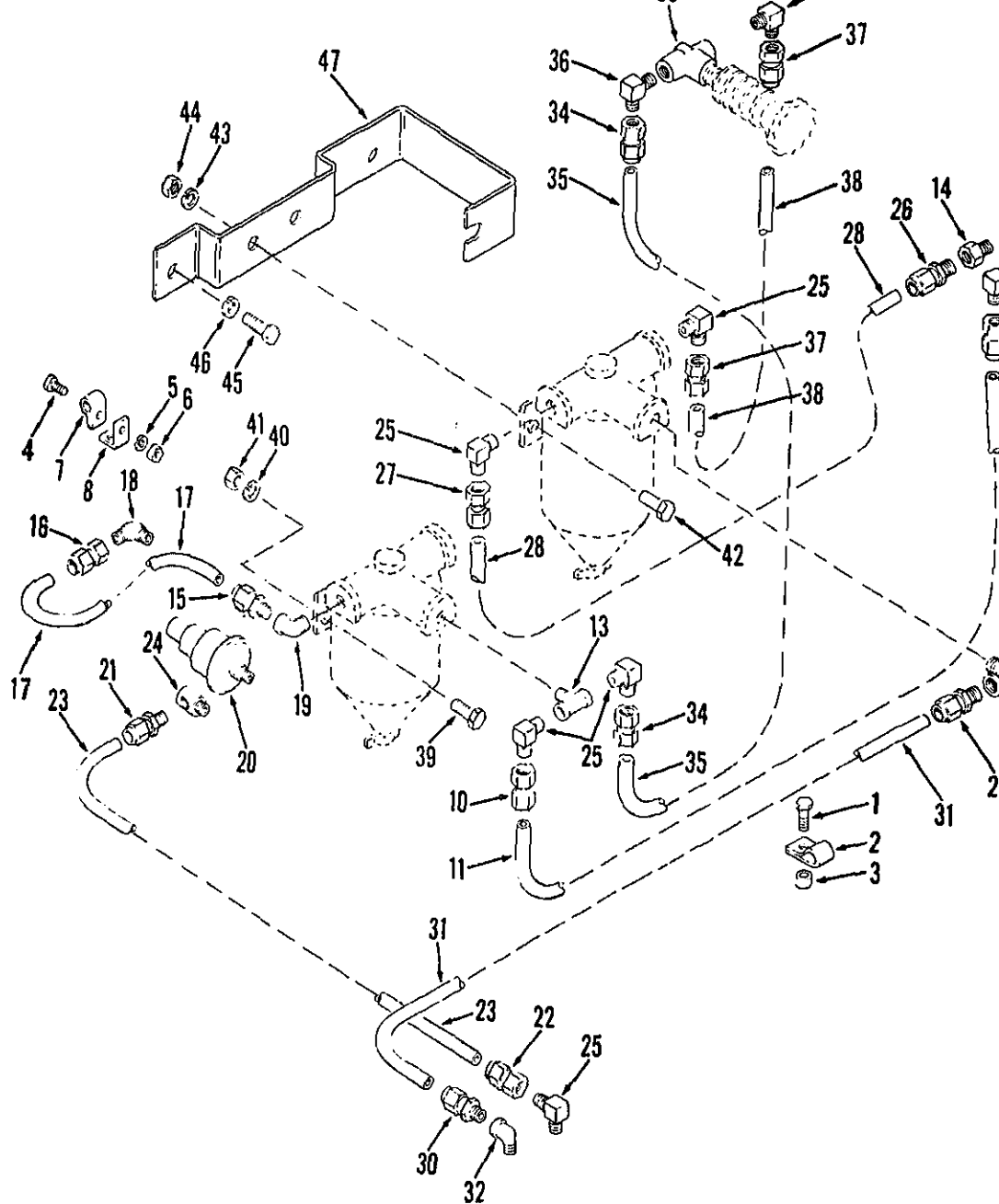
b. Drain. If it appears that there is water in the tank it will be necessary to drain the fuel tank. Refer to figure 4-21 and open the drain valve. Provide a suitable container to drain the fuel into.

c. Filler Screen. Pull the filler screen out of the tank and check for dirt that may be on screen. If necessary, remove the screen and wash it in clean fuel.



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Figure 4-21. Fuel tank service.



- 1 Capscrew
- 2 Clamp
- 3 Spacer
- 4 Capscrew
- 5 Lockwasher
- 6 Nut
- 7 Clamp
- 8 Bracket
- 9 Fitting
- 10 Fitting

- 17 Hose
- 18 Elbow
- 19 Adapter
- 20 Pressure switch
- 21 Fitting
- 22 Fitting
- 23 Hose
- 24 Fitting
- 25 Elbow

- 32 Elbow
- 33 Fitting
- 34 Hose
- 35 Elbow
- 36 Fitting
- 37 Hose
- 38 Capscrew
- 39 Lockwashers

meral. The starting aid (fig. 4-23) is used to start the crane engine during cold weather operation. Under normal conditions or even in cold weather, if the crane has not been started for a while, the priming pump should be tried first. The starting aid consists of a cylinder filled with pressurized ethyl ether, a dispensing valve and linkage required to properly dispense the quantity of ether.

WARNING

The ethyl ether contained in the starting aid cylinder is a potentially dangerous substance. Keep the cylinder away from heat, sparks or open flame. Avoid breathing vapors or contact of skin with ether.

Cylinder Replacement. Refer to figure 4-23 and replace the cylinder as follows:

Loosen wing nuts on clamp (11) and unscrew r (12).

If cylinder is not to be replaced immediately remove protective cap on to valve (10) to prevent dirt or ether from entering valve.

Install a new cylinder and tighten wing nuts on clamp.

Activate control knob (4) to test unit, if necessary, remove fitting (7) from engine to see if ether is being ejected.

Removal and Disassembly. Refer to figure 4-23 to remove and disassemble the starting aid as follows:

Remove the cylinder as described in paragraph 4-31 b and install protective cap on valve (10).

To replace defective valve (10) remove screws (1), lockwashers (2) and nuts (3). Loosen screw (9) and remove knob (4) and cable (5).

Remove tube (6) and fittings (7 and 8) as required for repair or removal of valve (10).

To remove clamp (11) remove the nuts and screws attaching it to bracket (15). Remove screws (13) and lockwashers to remove bracket.

Cleaning, Inspection and Repair.

Wipe clean the cable (5) and the outside of the valve (10). Wipe or using a metal brush clean any dirt that could interfere with the operation of the starting aid.

Inspect the cable (5) for damage. Inspect the valve for damage and operate the lever on the valve checking for a smooth operation. Inspect

(1), lockwashers (2) and nuts (3). Install set screws removed, but do not tighten.

(3) Install fittings (7 and 8) and tube (6). Pass cable (5) and knob (4) through guide on valve (10) and secure hooked end of cable onto valve lever.

(4) Adjust cable (5) so that when knob (4) is pushed out the lever on bottom of valve is fully actuated. Tighten set screw.

(5) Remove protective cap from valve (10) and install in cylinder (12). Tighten wing nuts on clamp (11) to secure cylinder in place.

4-32. Throttle Control Linkage

a. General. The throttle control linkage (fig. 4-24) enables the operator to control the engine idle speed. A control stand and throttle lever in the crane cab is connected by a cable to the associated linkage to the engine speed governor located in the engine compartment. The throttle lever travels from low to high idle in an approach of 100 degree arc.

b. Removal and Disassembly. Refer to figure 4-24 and disassemble the throttle control linkage to the point required for replacement, repair or adjustment.

c. Cleaning, Inspection and Repair.

(1) Clean any excess oil or dirt from the throttle linkage with a clean cloth or if necessary a wire brush.

(2) Inspect all parts of the throttle for damage and excessive wear. Inspect all hardware for missing parts. Inspect cable to insure it is properly mounted and connected to the speed governor throttle operating lever (22, fig. 4-24).

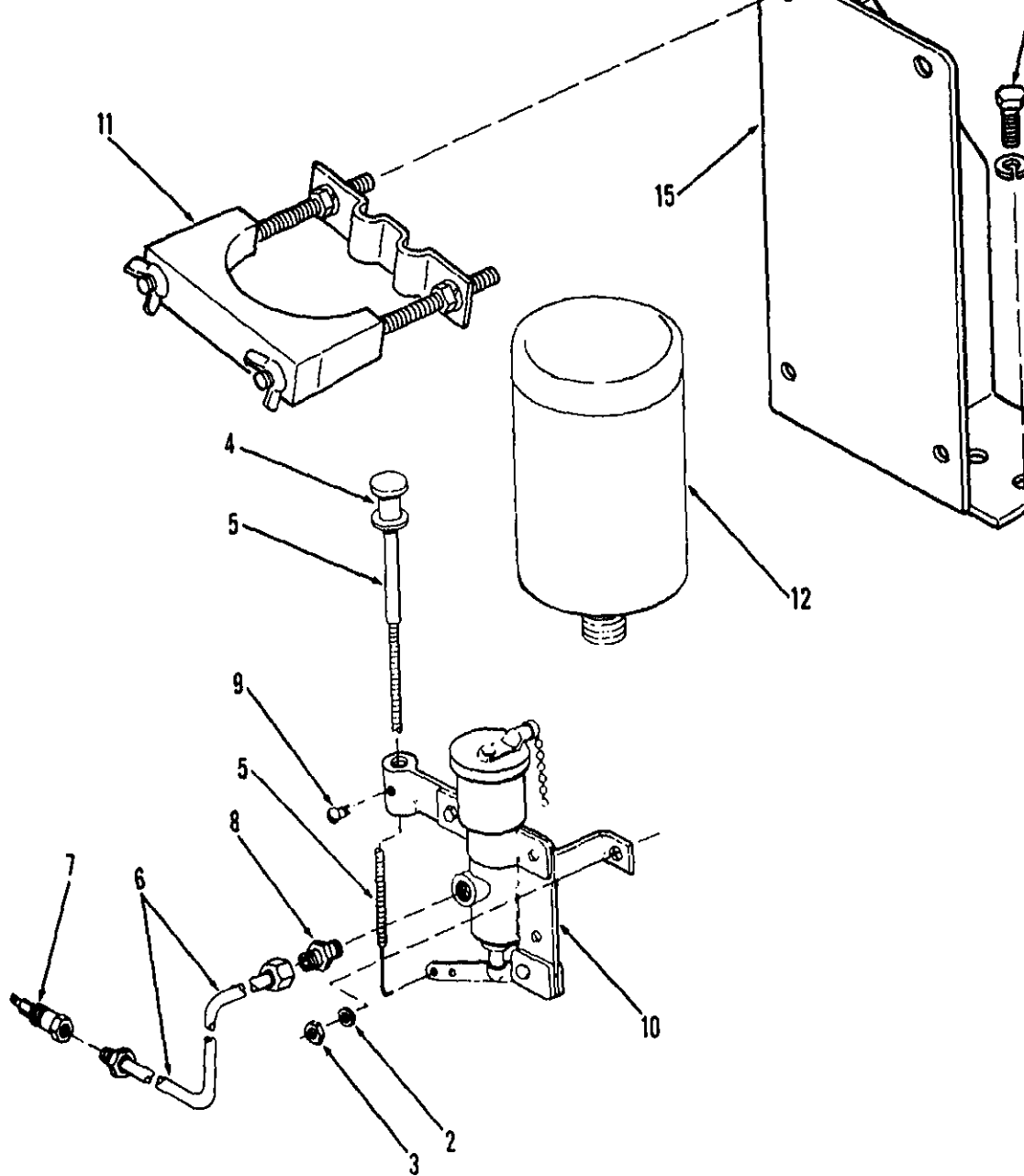
(3) Repair of throttle linkage is limited to replacement of defective parts and adjustment of cable (34) or throttle lever.

d. Reassembly and Installation. Refer to figure 4-24 and reassemble the throttle linkage as follows:

(1) Reassemble all parts of throttle linkage except for cable (34), cable mounting hardware and throttle cover (24).

(2) Line the lever (13) straight up, vertically. Line the lever (22) straight across horizontally. Tighten screw (19).

(3) Push the throttle lever forward (away from operator) to low idle. Attach cable (34) to the forward hole (see fig. 4-25) on lever (22) with cotter pin (20) and cotter pin (21). Secure cable in place by attaching (15) and (13) to (12) and (23) to (14).



1 Capscrew
2 Lockwasher
3 Nut
4 Knob
5 Cable
6 Tube

9 Set screw
10 Valve
11 Clamp
12 Cylinder
13 Capscrew
14 Lockwasher

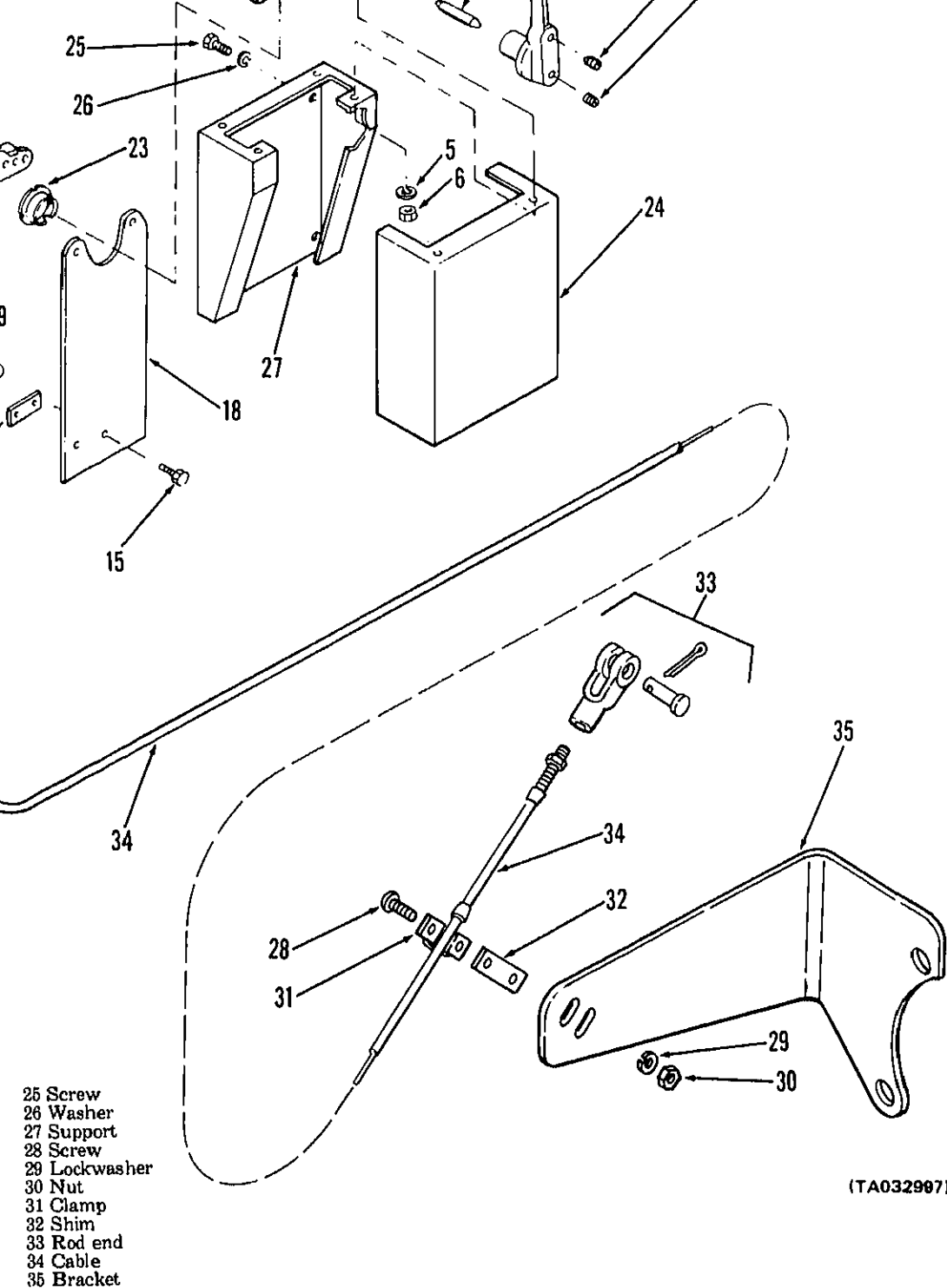
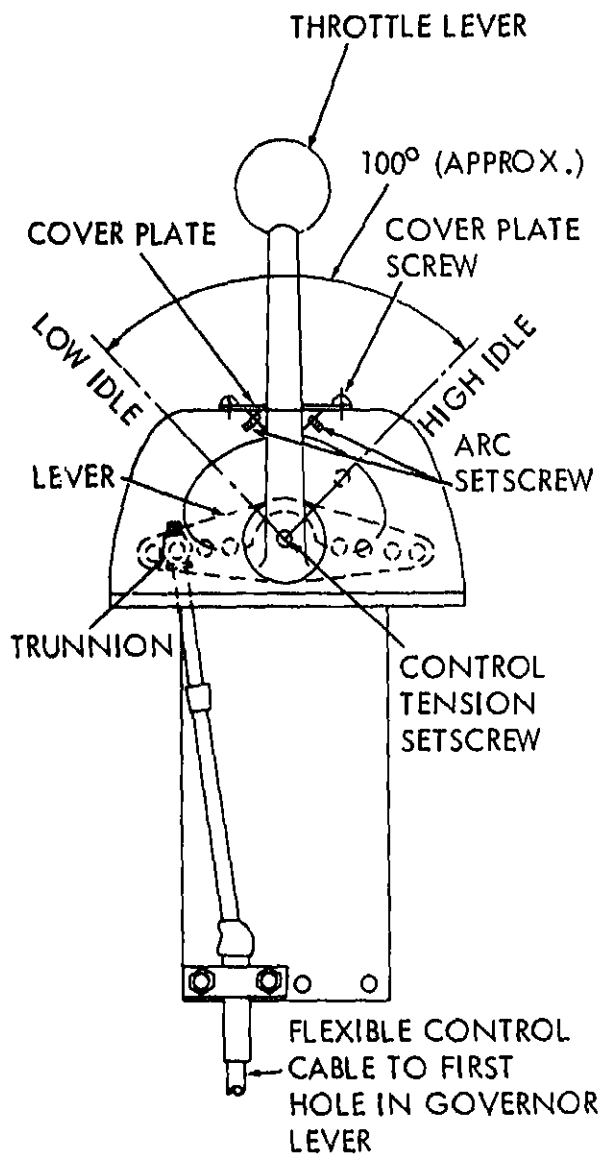


Figure 4-21. Throttle linkage assembly

STEP 3. ADJUST CONTROL TENSION
SETSCREW SO THAT LEVER
WILL HOLD FIRM IN ANY
DESIRED POSITION.



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Figure 4-25. Throttle control linkage adjustment.

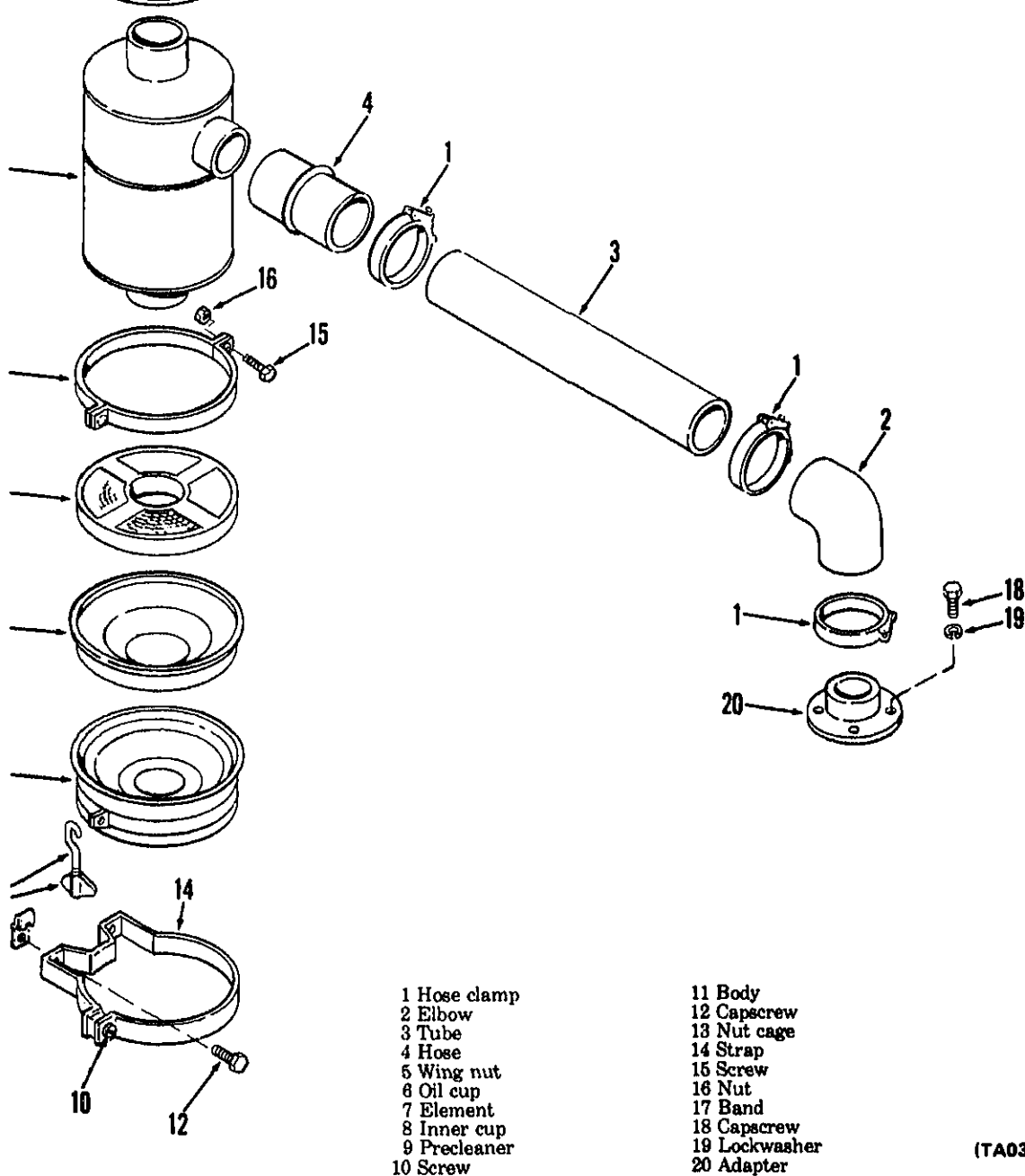


Figure 4-26. Air cleaner assembly.

ove body (11).

(4) If required for replacement remove screws and nut cages (13) and strap (14). Remove screw (15), (16) and band (17). To replace a damaged adapter remove screws (18) and lockwashers (19).

Cleaning, Inspection and Repair.

(1) Clean all metallic parts, carefully and thoroughly with an approved cleaning solvent such as Med. Spec. PD-680. In addition, clean precleaner (9) and body (11) using compressed air. It is important that the air cleaner assembly is cleaned thoroughly for proper engine operation.

(2) Inspect hose (4), tube (3) and elbow (2) for cracks, frays or other damage. Inspect precleaner (9),

(1) Secure adapter (20) to engine with screws and lockwashers (19). If strap (14) has been removed, install, using screws (12) and nut cages (13).

(2) Slide band (17) onto body (11) and tighten screws (15) and nuts (16). Place body (11) into housing (14) and tighten screw (10).

(3) Place element (7) and inner cup (8) into housing (6). Fill cup with clean engine oil to level marked specified in LO5-3810-295-12-2. Carefully line cup with body (11) and secure in place by tightening wing nuts (5).

(4) Install precleaner (9). Secure hose (4), tube (3) and elbow (2) between air cleaner and engine using hose clamps (1).

Section XIV. MAINTENANCE OF COOLING SYSTEM

15. General

To prevent engine parts from damage due to excessive heat a cooling system is required. The engine cooling system consists of the radiator, fan, water pump, thermostat and hoses.

WARNING

To prevent skin burns from hot coolant, let engine cool before working on cooling system.

16. Thermostat Test and Replacement

Fig. 4-27

a. Removal. Remove the thermostat as follows:

(1) Drain cooling system as described in paragraph 3-14.

(2) Remove hose clamps and hoses as shown in figure 4-27. Remove thermostat housing and discard using gasket.

b. Test. Test the thermostat for proper operation by suspending it and a thermometer in a container of water. Heat the water. When the thermometer indicates between 160°F. and 165°F., the thermostat should begin to open. It should be fully open when the temperature has risen to between 185°F. and 190°F. Remove the thermostat from the water when

it is fully open. The cool surrounding air should cause the thermostat to close rapidly. Replace defective thermostat.

c. Replacement and Installation.

(1) Install the thermostat into engine housing. Install new gasket and apply gasket sealer. Reinstall gasket housing, hose and clamps.

(2) Fill the cooling system with coolant as described in paragraph 3-14.

4-37. Hose and Fan Replacement

Fig. 4-28

a. Drain cooling system as described in paragraph 3-14.

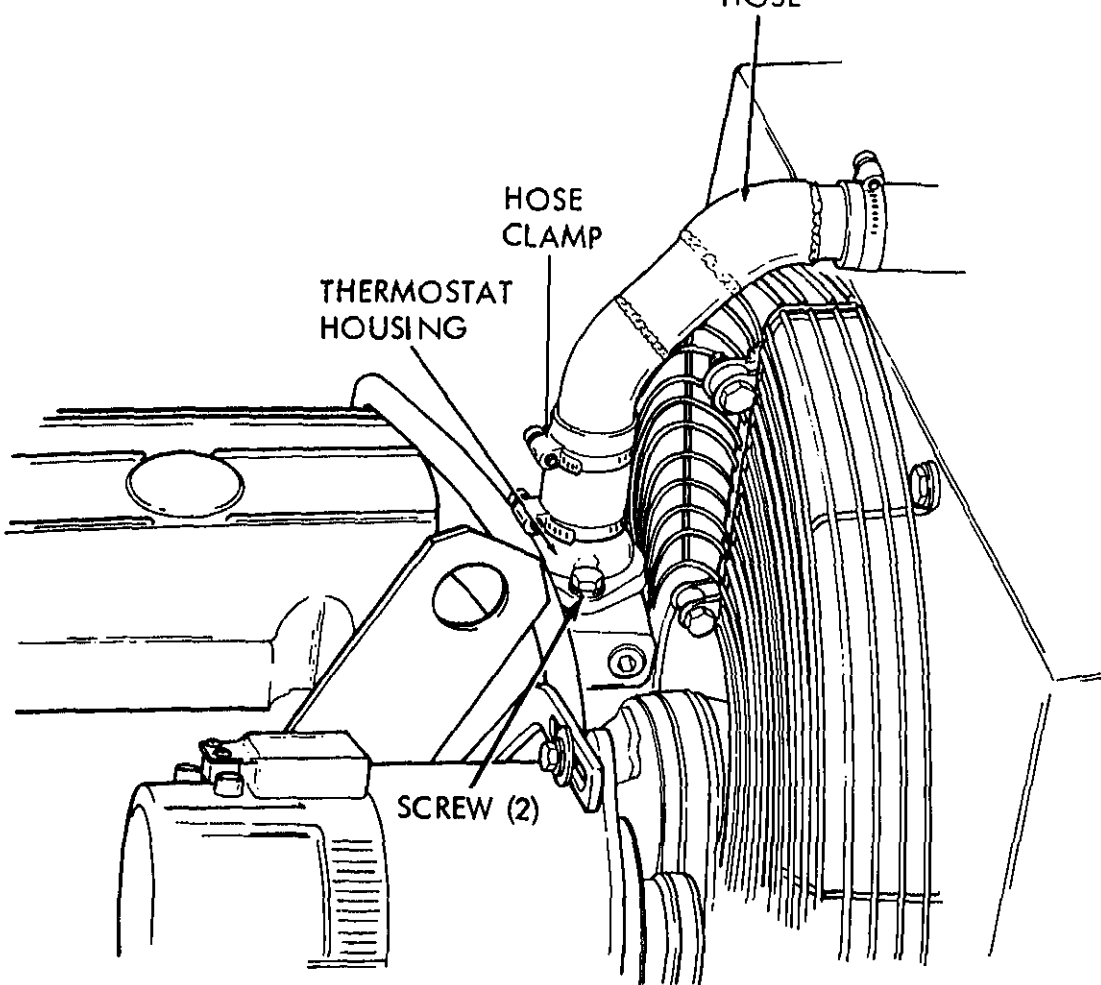
b. Refer to figure 4-28 and remove hose clamps and defective hoses.

c. Replace hoses and secure with hose clamps.

d. Refer to paragraph 3-14 and refill cooling system.

e. Remove fan guard screws and fan guard. Remove alternator adjustment bracket and remove V-belt. Remove fan capscrews and fan blade.

f. Replace fan blade as required and secure it with fan capscrews. Install and secure fan guard using fan guard capscrews.



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Figure 4-27. Thermostat removal.

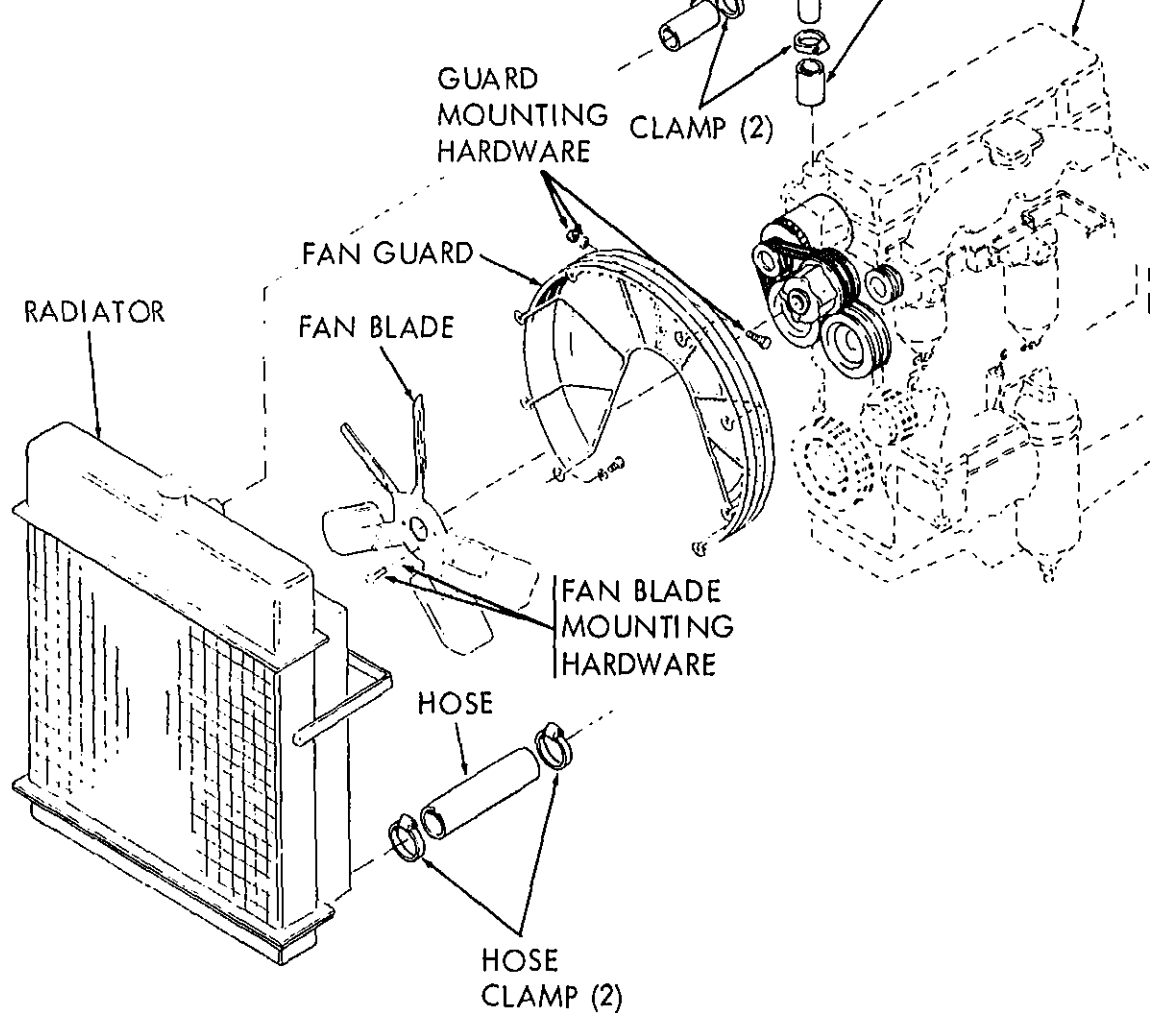


Figure 4-28. Hoses and fan removal.

Section XV. MAINTENANCE OF ENGINE ELECTRICAL SYSTEM

4-38. General

The engine electrical system operates off of two 12-volt batteries connected in series which provides a 24-volt power source. In addition to the batteries, the system consists of an alternator with an internal voltage regulator, polarity relay, starter, radio suppression components as described in paragraph 4-15, sending units and gages, and other minor components as shown on figure 1-8. A battery disconnect switch is provided on the side of the

personnel from tampering with the crane controls.

WARNING

Always place battery disconnect switch in OFF position when working on electrical system.

4-39. Alternator and Belt

a. *General.* The alternator is a twin 24-volt, 60-ampere type with solid state mounted rectifiers. It is designed for use

5) Adjusting screw and remove V-belts
 alternator pulley.
 6) Reconnect electrical leads to
 correct terminals.

described in subparagraph 6 above. Tighten
 alternator hardware.
 (6) Reconnect electrical leads.

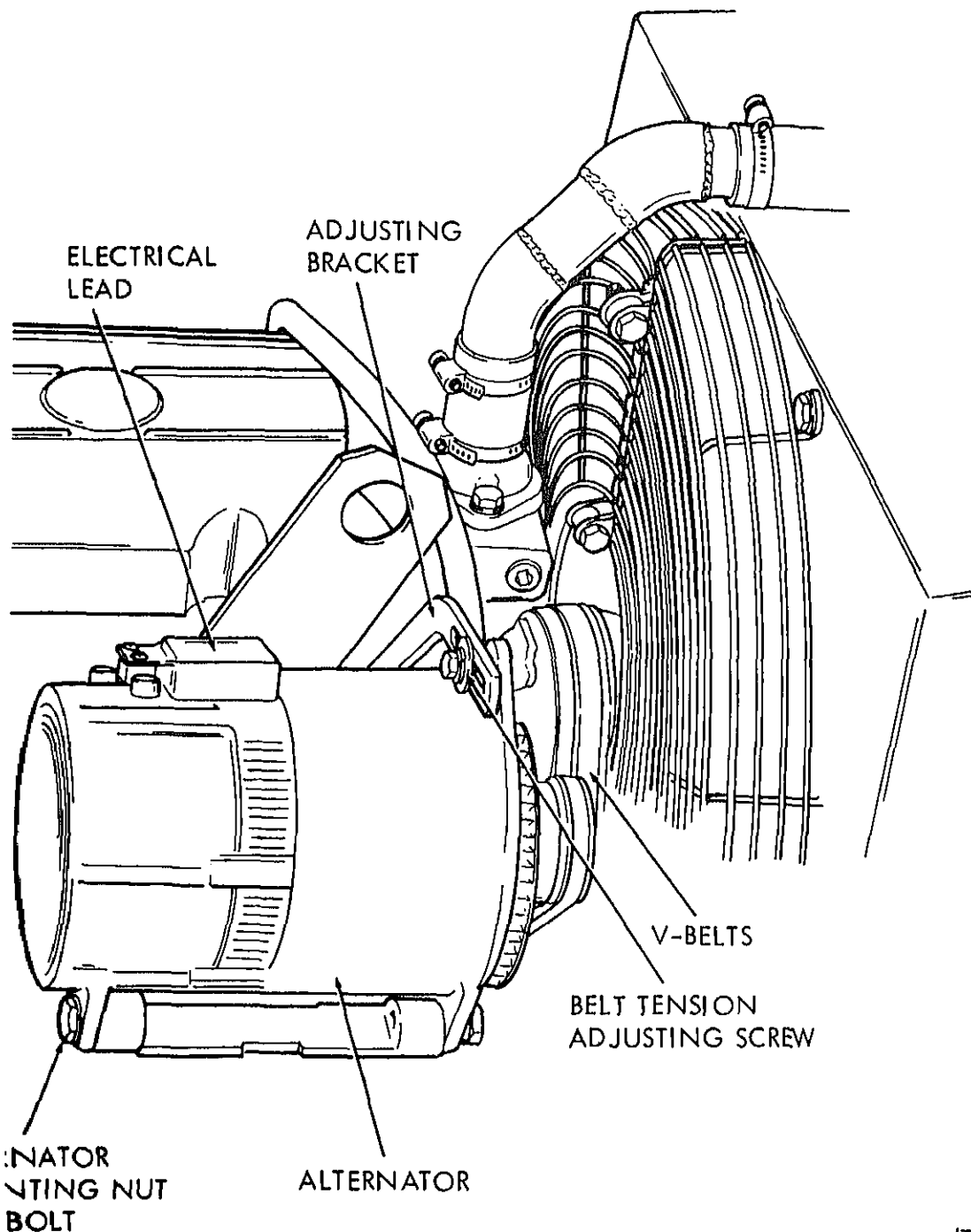


Figure 4-29. Alternator and belt adjustment and replacement

...till it starts. When the engine starts, the starter motor automatically disengages.

CAUTION

Never crank the engine for more than 30 consecutive seconds with the starter motor. If this does not start the motor, wait at least one minute before trying again.

NOTE

Turn battery disconnect switch on when checking voltage on at starting motor battery terminal.

b. Motor and Solenoid Test. Before removing the motor make the following tests. Check the batteries and make sure that the batteries are in good condition. Inspect all starting motor wiring for frayed insulation or other damage. Replace or repair damaged wiring. Inspect all connections to the starting motor, solenoid, magnetic switches, ignition switch, start pushbutton, and battery, including all ground connections. Clean, tighten or replace any defective connections. If the trouble is not found, connect jumper wire around any switch or solenoid suspected of being defective. If the system functions properly using this method, replace the defective item. If none of the above isolates the trouble, check the starting motor battery terminal, using a voltmeter adjusted for dc operation, and measure the battery voltage. If voltage is 22 to 24 volts, replace the starting motor.

c. Solenoid Replacement. Refer to figure 4-30 and replace solenoid as follows:

- (1) Make sure battery disconnect switch is in the OFF position.
- (2) Disconnect electrical leads. Tape and mark leads to aid in reconnecting lead to correct terminal.
- (3) Remove solenoid mounting capscrews and remove solenoid.
- (4) Install new solenoid and secure with capscrew. Reconnect electrical leads.

d. Starting Motor Replacement. Refer to figure 4-30 and replace starting motor as follows:

- (1) Make sure battery disconnect switch is in the OFF position.
- (2) Disconnect electrical leads. Tape and mark leads to insure reconnecting each lead to correct terminal.

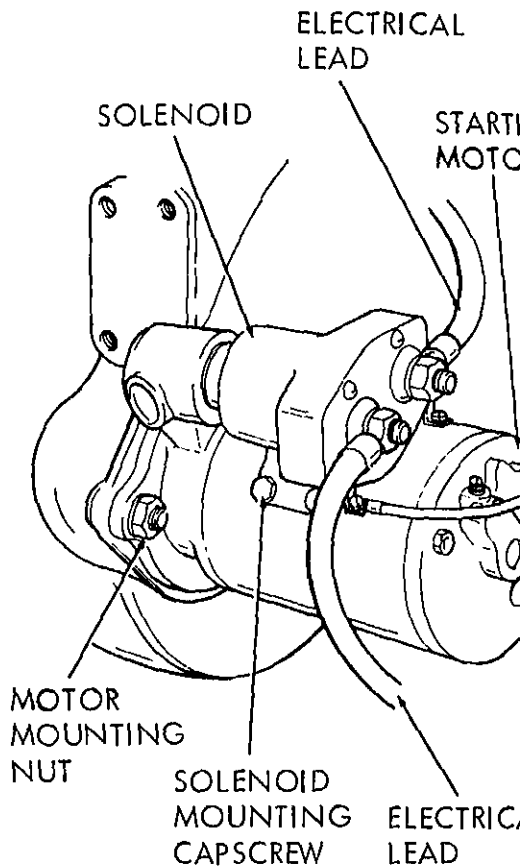


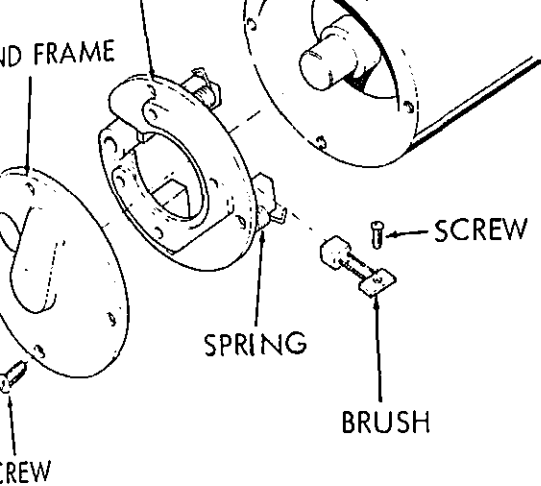
Figure 4-30. Starting motor and solenoid replacement.

e. Starting Motor Brushes Replacement. Replace starting motor brushes as shown on figure 4-31.

f. Starting Solenoid Replacement. Replace solenoid as shown on figure 4-32.

4-41. Radio Suppression Component Placement

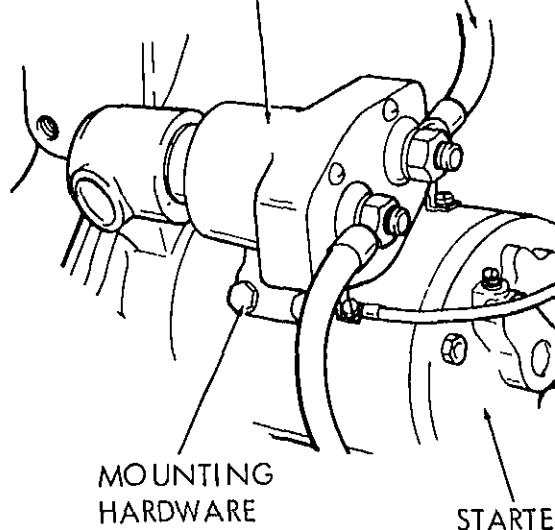
Refer to paragraph 4-17 for replacement of interference components.



- STEP 1. MAKE SURE BATTERY DISCONNECT SWITCH IS IN THE OFF POSITION.
- STEP 2. REMOVE END FRAME SCREWS AND PULL END FRAME FROM STARTER ASSEMBLY.
- STEP 3. INSPECT BRUSHES, IF EXCESSIVELY WORN, REPLACE.
- STEP 4. REMOVE SCREW SECURING BRUSH, LIFT SPRING, REMOVE BRUSH AND REPLACE.

(TA033004)

Figure 4-31. Starting motor brush replacement.



- STEP 1. TAG AND REMOVE ELECTRICAL LEADS.
- STEP 2. REMOVE MOUNTING HARDWARE AND LIFT SOLENOID OFF STARTER.

(TA033005)

Figure 4-32. Starting solenoid, removal and installation.

Section XVI. MAINTENANCE OF CRANE ELECTRICAL SYSTEM

2. General.

The crane electrical system operates off the 24-volt power supply described in paragraph 4-38. The system consists primarily of the control panel and associated knobs, switches, indicator lights, and gages. Also crane running lights, spot lights, and trouble light. The crane electrical system also includes the wiring and components that make up the Load/Movement Safety Device shown on figure 1-9.

4-43. Control Panel, Switches, Gages and Lights

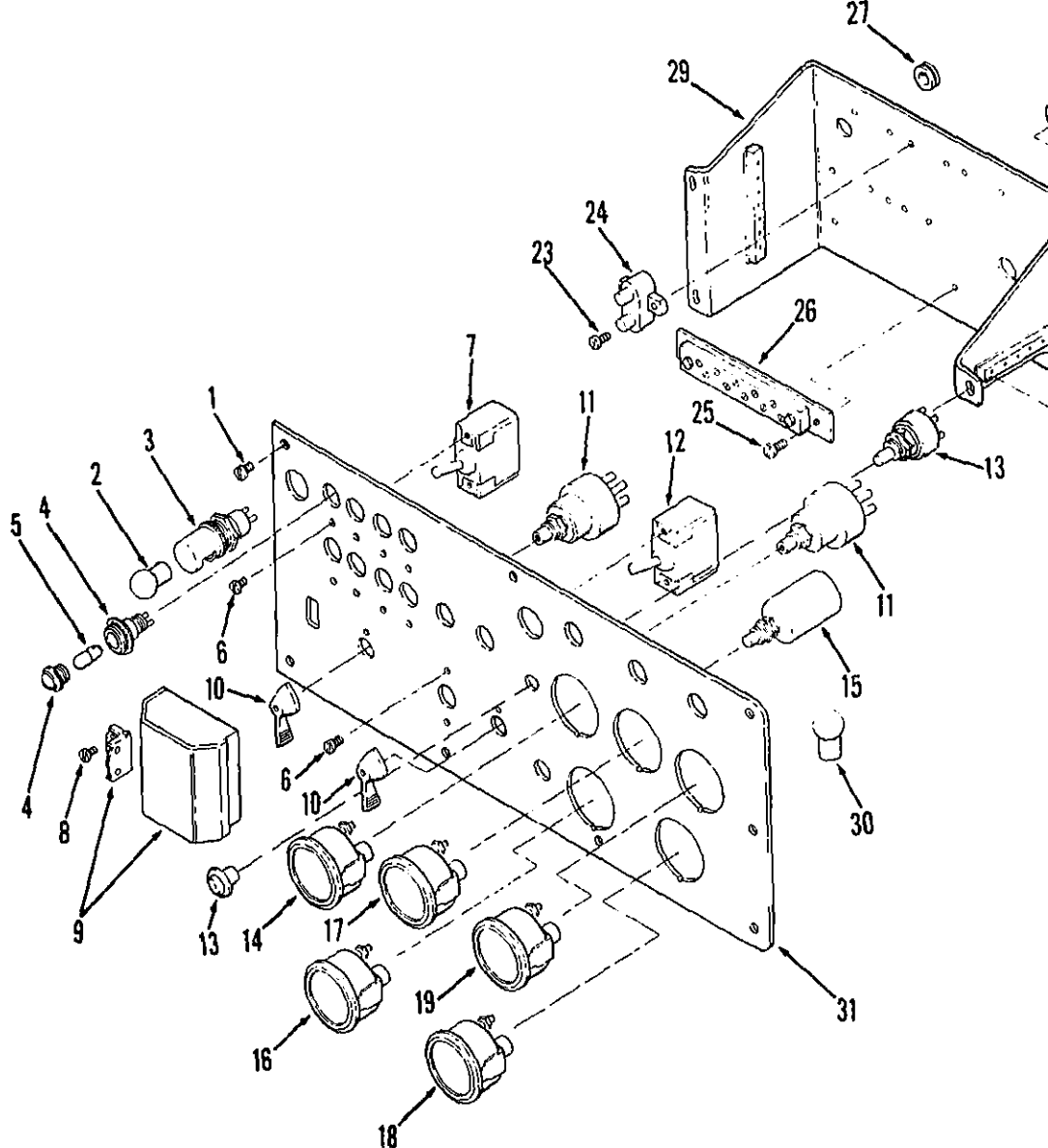
NOTE

The switches, gages and lights are described in paragraph 2-26.

- a. *Test.* Start crane engine and operate all controls and electrical controls while checking for proper operation.

WARNING

Prior to performing maintenance on any

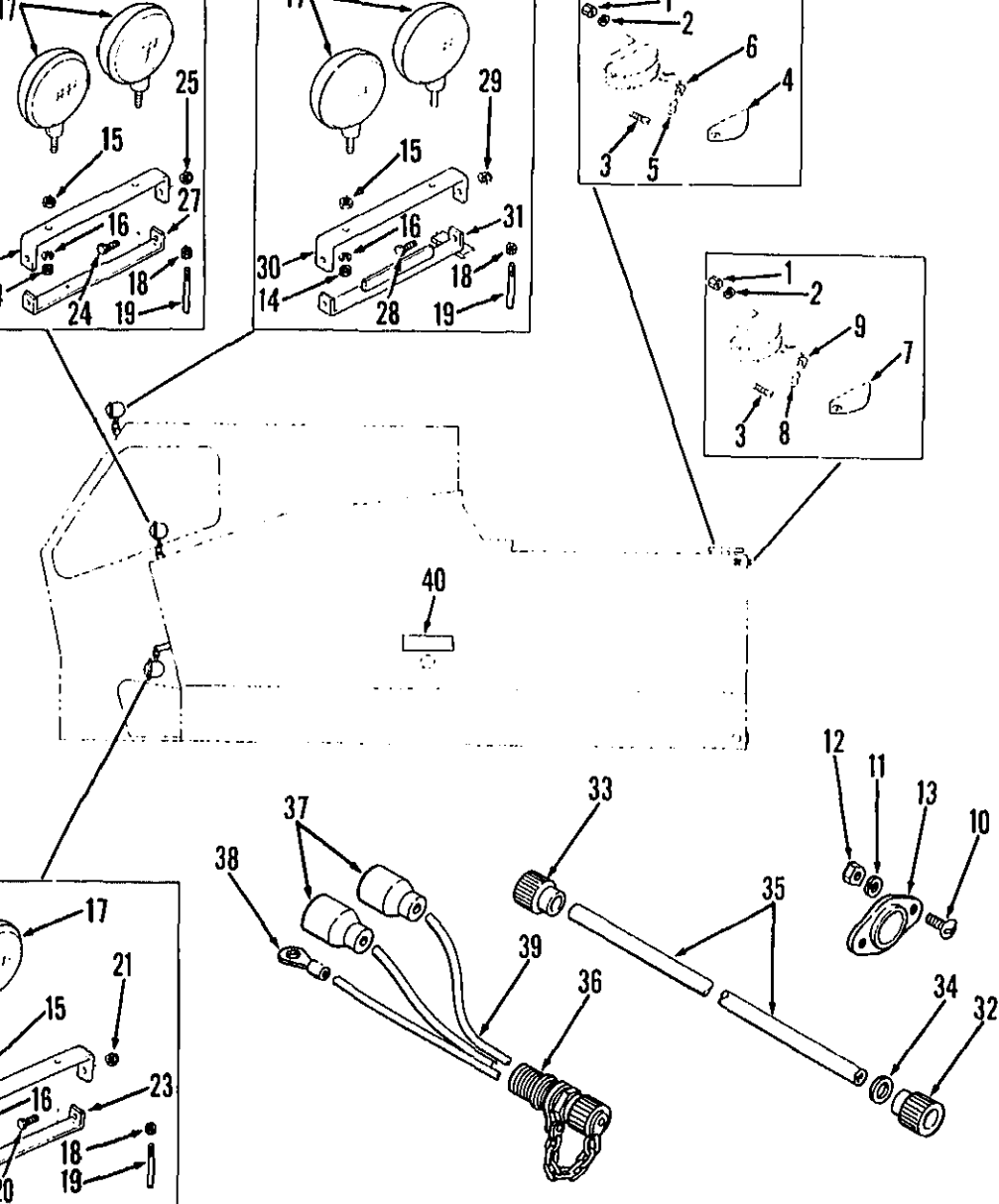


1 Screw
 2 Lamp
 3 Light
 4 Light
 5 Lamp
 6 Screw
 7 Switch
 8 Screw
 9 Screw
 10 Lever
 11 Switch

12 Switch
 13 Switch
 14 Indicator
 15 Switch
 16 Indicator
 17 Indicator
 18 Indicator
 19 Indicator
 20 Screw
 21 Lockwasher
 22 Screw

23 Screw
 24 Circuit breaker
 25 Screw
 26 Terminal board
 27 Grommet
 28 Grommet
 29 Bracket
 30 Lamp
 31 Panel

Figure 4-33. Instrument panel assembly - exploded view.



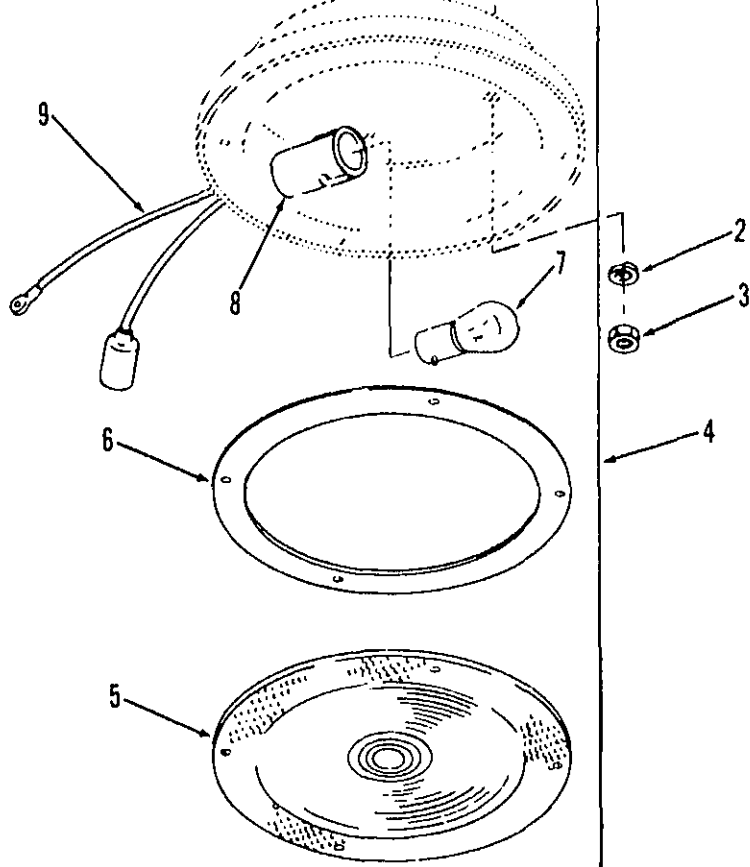
(TA033007)

Nut
Washer
Screw
Reflector
Lens
Lamp
Lampholder
Lens
Lamp
Lampholder
Screw

21 Washer
22 Nut
23 Bracket
24 Nut
25 Lockwasher
26 Nut
27 Flood light
28 Locknut
29 Adapter
30 Screw

21 Nut
22 Bracket
23 Bracket
24 Screw
25 Nut
26 Bracket
27 Bracket
28 Screw
29 Nut
30 Bracket

31 Bracket
32 Connector
33 Connector
34 Nut
35 Cable
36 Connector
37 Connector
38 Terminal lug
39 Wire
40 Instruction plate



- 1 Screw
- 2 Lockwasher
- 3 Nut
- 4 Dome light assembly
- 5 Lens
- 6 Gasket
- 7 Lamp
- 8 Socket
- 9 Lead

Figure 4-35. Dome light assembly.

4-46. Horn Switch

a. General. The horn is provided to warn personnel working near crane of crane movement which could endanger their safety.

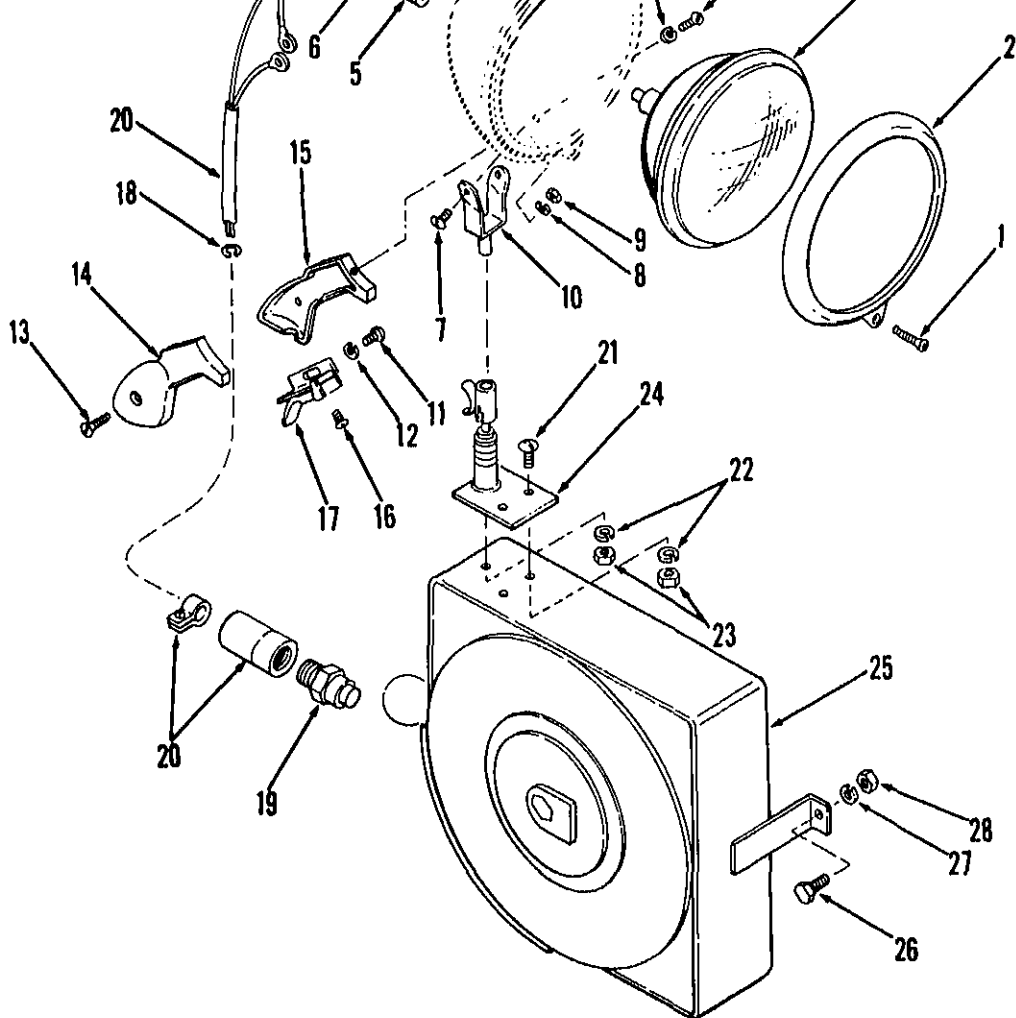
b. Replacement. Refer to figure 4-37, remove jam nuts and replace defective switch and/or wiring.

4-47. Sending Units

a. General. Temperature sending units send electrical signals to gages and lights located on control panel indicating trouble in a system.

units can be tested by removing unit from block and immersing in a pan of water. If temperature exceeding high temperature for unit (225°F. for the water and the oil unit). If sending unit does not show temperature on gage or activate warning, replace unit.

c. Replacement. Drain oil or water below sending unit being replaced. Disconnect lead or tube from unit and replace with new unit. Reconnect lead or tube. Refill oil.



- 1 Screw
- 2 Rim
- 3 Clip
- 4 Lamp
- 5 Connector
- 6 Connector
- 7 Screw
- 8 Lockwasher
- 9 Nut
- 10 Mount

- 11 Screw
- 12 Lockwasher
- 13 Screw
- 14 Handle
- 15 Handle
- 16 Screw
- 17 Trigger
- 18 Retaining ring
- 19 Connector
- 20 Cable

- 21 Screw
- 22 Lockwasher
- 23 Nut
- 24 Bracket
- 25 Reel
- 26 Screw
- 27 Lockwasher
- 28 Nut

Figure 4-36. Trouble light assembly.

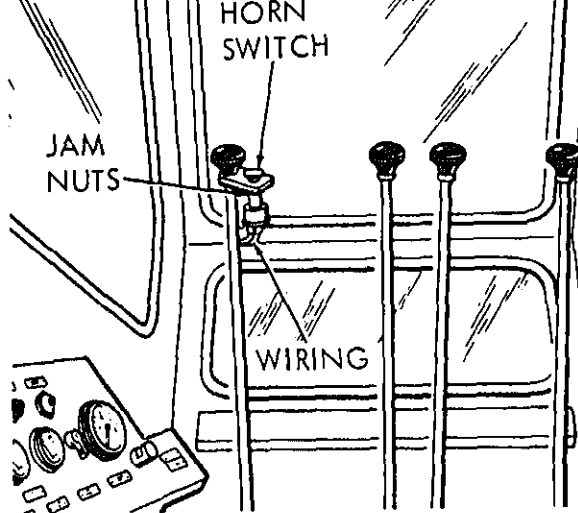
48. Battery Cables

a. Service. Service battery cables as follows:

(1) Clean cables and terminals with a wire brush.

frayed insulation, or damaged cables.

(3) Coat cable leads and terminals with a GAA grease to help prevent corrosion.



- STEP 1. REMOVE JAM NUTS.
- STEP 2. REMOVE HORN SWITCH.
- STEP 3. REMOVE WIRING.

(TA033010)

Figure 4-37. Horn switch assembly.

4-49. Batteries

Fig. 4-38

a. Test.

(1) Fill cells to bottom of square or 3/8 inch above separators with sulfuric acid of 1.280 ± 0.005 specific gravity at 70°F. Battery and acid must be at a temperature above 60°F., but preferably not above 100°F. Let battery stand 30 minutes after filling, then, check electrolyte specific gravity of each cell, correcting readings to 77°F. by using TM9-6140-200-12.

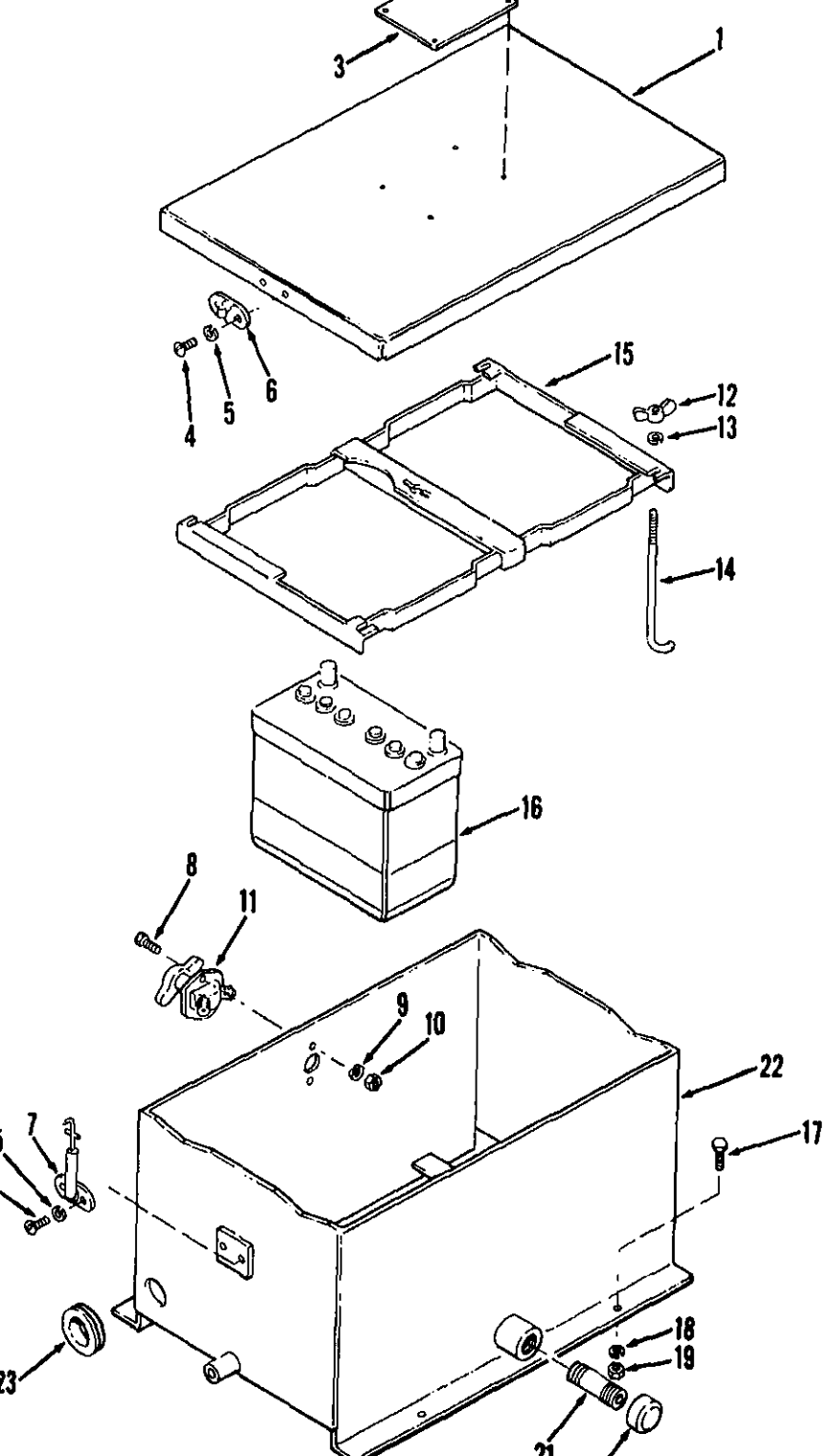
(2) The battery is now ready for use unless one or more of the following conditions exist: The specific gravity is below 1.250 after the 30 minute stand; the battery will not be used within 12 hours after filling; or the battery is going into service in temperature below 0°F. If one or more of the above conditions exist, the battery should

be used if available, but constant potential used if temperature is controlled below 1 interrupted charging.

b. Replacement. Make sure battery disconnect switch (11) is in OFF position. Refer to figure 4-38 and replace batteries as follows:

- (1) Release latch (7) and remove cover (8).
- (2) Disconnect battery cables.
- (3) Remove wing nuts (12) washers (14) and retainer (15). Remove batteries (16).
- (4) Remove pipe cap (20) and wash (21) with water. Dry thoroughly.
- (5) Replace fully charged batteries (16).
- (6) Screw pipe cap (20) on nipple (21). Tighten bolts (14), lockwashers (13) retainer (15) and nuts (12).

(7) Reconnect battery cables as shown in figure 4-38.



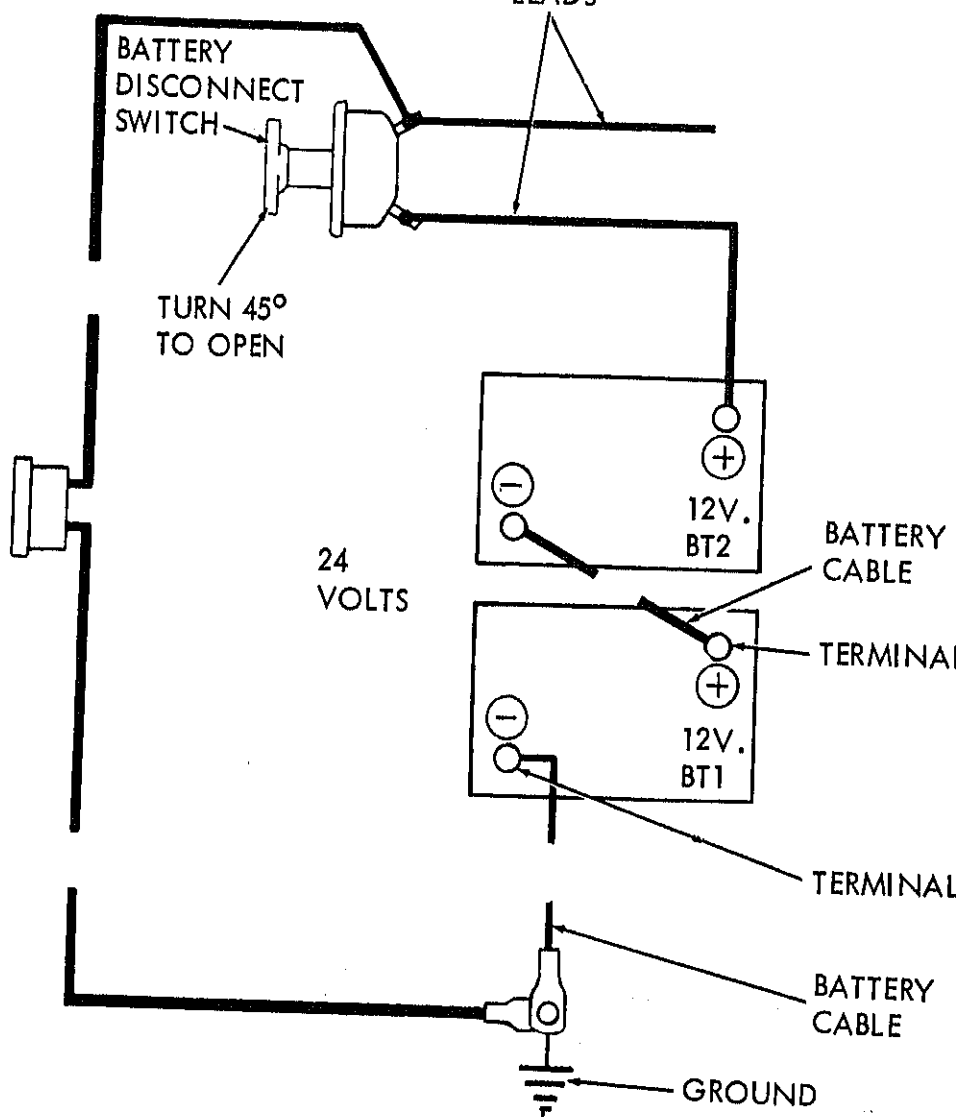


Figure 4-39. Battery cable connection.

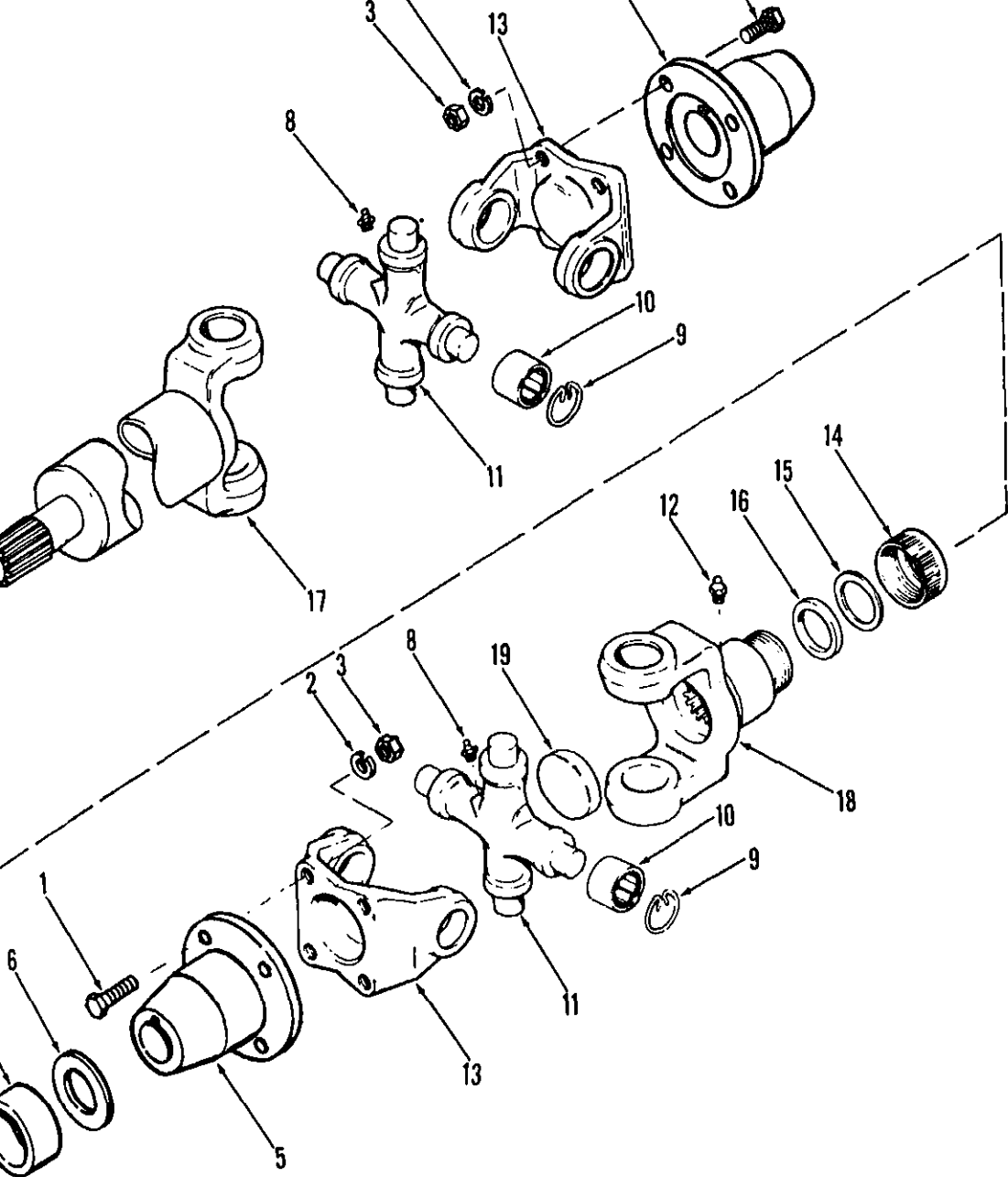
4-50. Battery Box Replacement

Refer to figure 4-38 and replace any damaged parts of the battery box assembly.

Section XVII. MAINTENANCE OF PROPELLER SHAFT

4-51. Propeller Shaft

b. Service. Lubricate the propeller shaft as described in LO5-3810-905 12



- 1 Bolt
- 2 Lockwasher
- 3 Nut
- 4 Flange
- 6 Flange

- 11 Cross journal
- 12 Lubrication fitting
- 13 Yoke
- 14 Cap

(TA033013)

4-53. Glass Replacement

a. *Removal.* Replace glass if cracked or broken, as follows:

(1) Place masking tape over glass to prevent small bits of glass from flying. Break out remaining glass.

(2) Moisten weatherstrip with soapy water.
(3) Position new glass in weatherstrip at lower corner of window frame.

(4) Using a tool as shown in figure 4-41, work around window frame locking glass into place using excessive force.

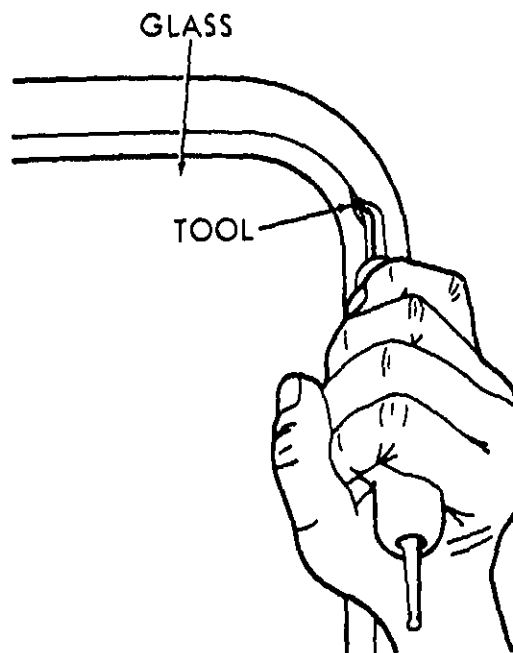
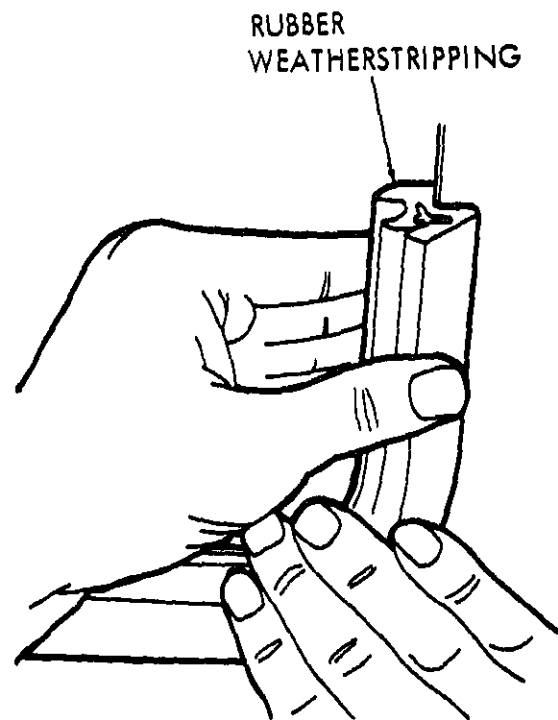


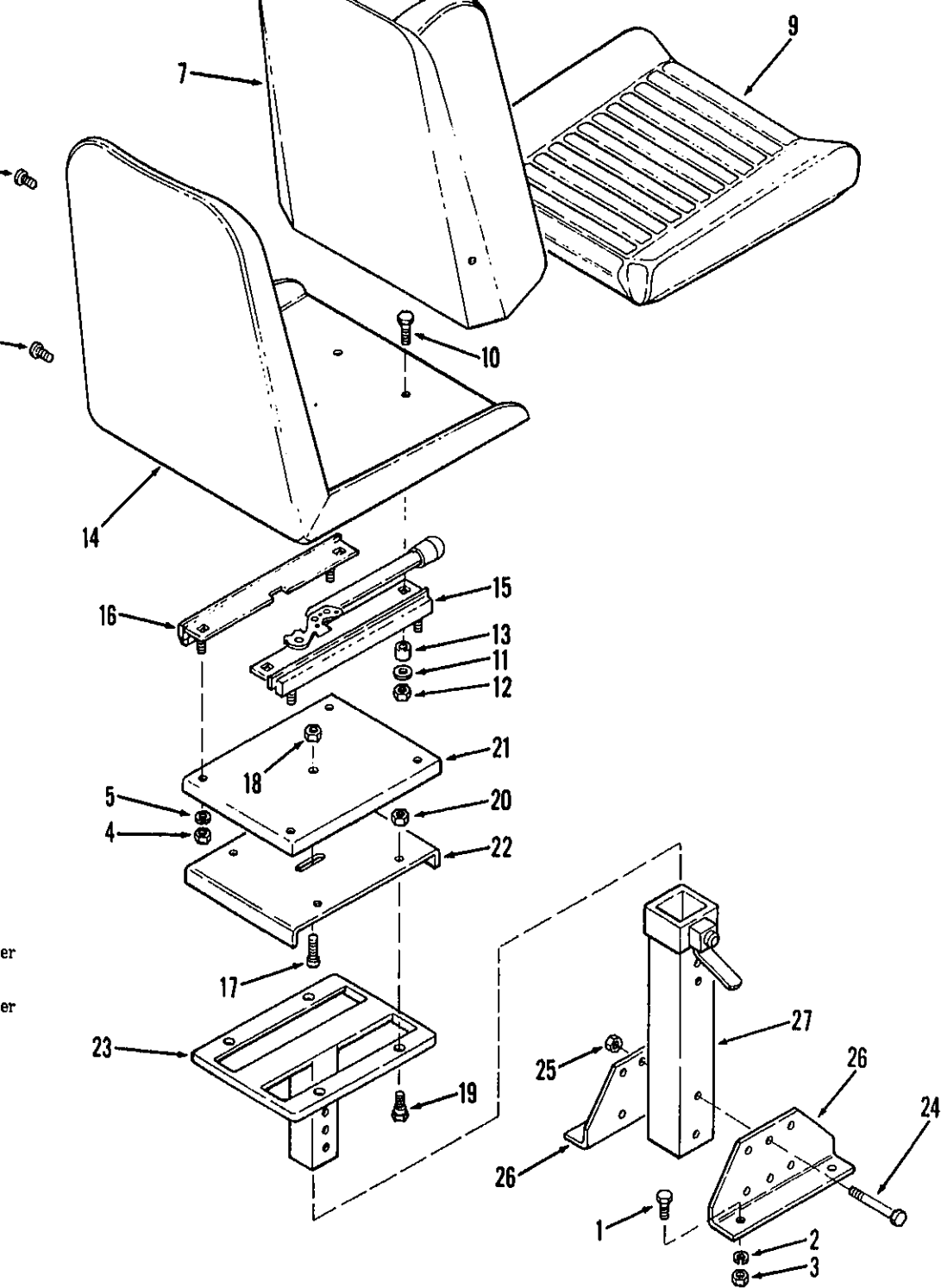
Figure 4-41. Window and weatherstripping, installation.

4-54. Operators Seat

a. *Removal.* Refer to figure 4-42 and remove capscrews (1), lockwashers (2) and nuts (3) to remove seat assembly.

c. *Repair.* Repair is limited to the replacement of defective parts.

d. *Reassembly and Installation.* Refer to figure 4-42 and reassembly as required. Position seat



1.

NOTE

If the heater or any heater hoses have to be removed, open drain cocks on heater assembly to drain coolant to level below heater.

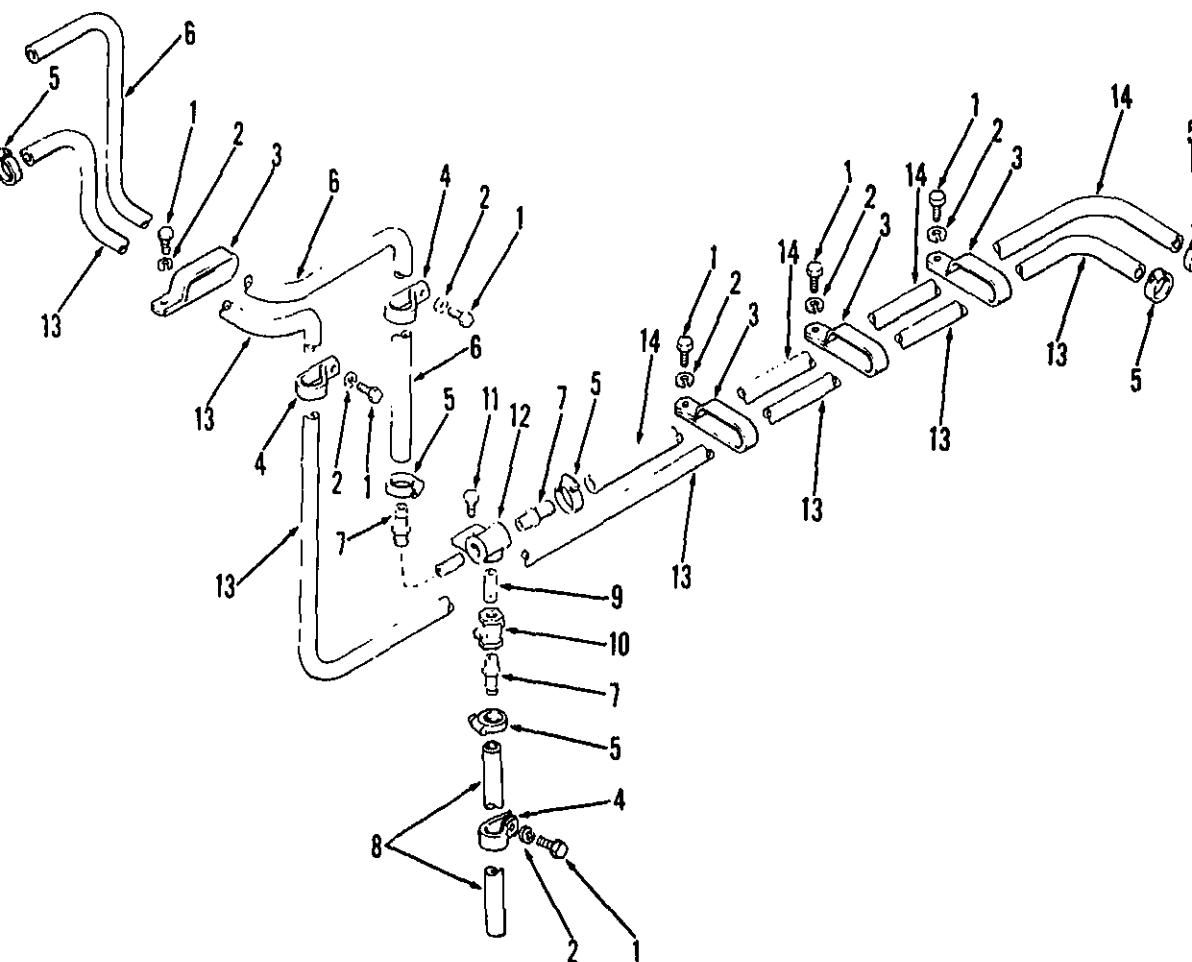
Removal. Refer to figures 4-43 and 4-44 and remove any damaged or defective parts.

Inspection, Cleaning and Repair.

clog and limit air flow.

(3) Repair heater, hoses and air duct replacing any defective parts and tightening hose and air duct connections.

d. Reassembly and Installation. Refer to figures 4-43 and 4-44 and reassemble the heater, hoses and air ducts as required. Tighten all hose connections. Close drain cocks and refill cooling system as described in paragraph 3-14.



1 Screw
2 Lockwasher

8 Hose
9 Nipple

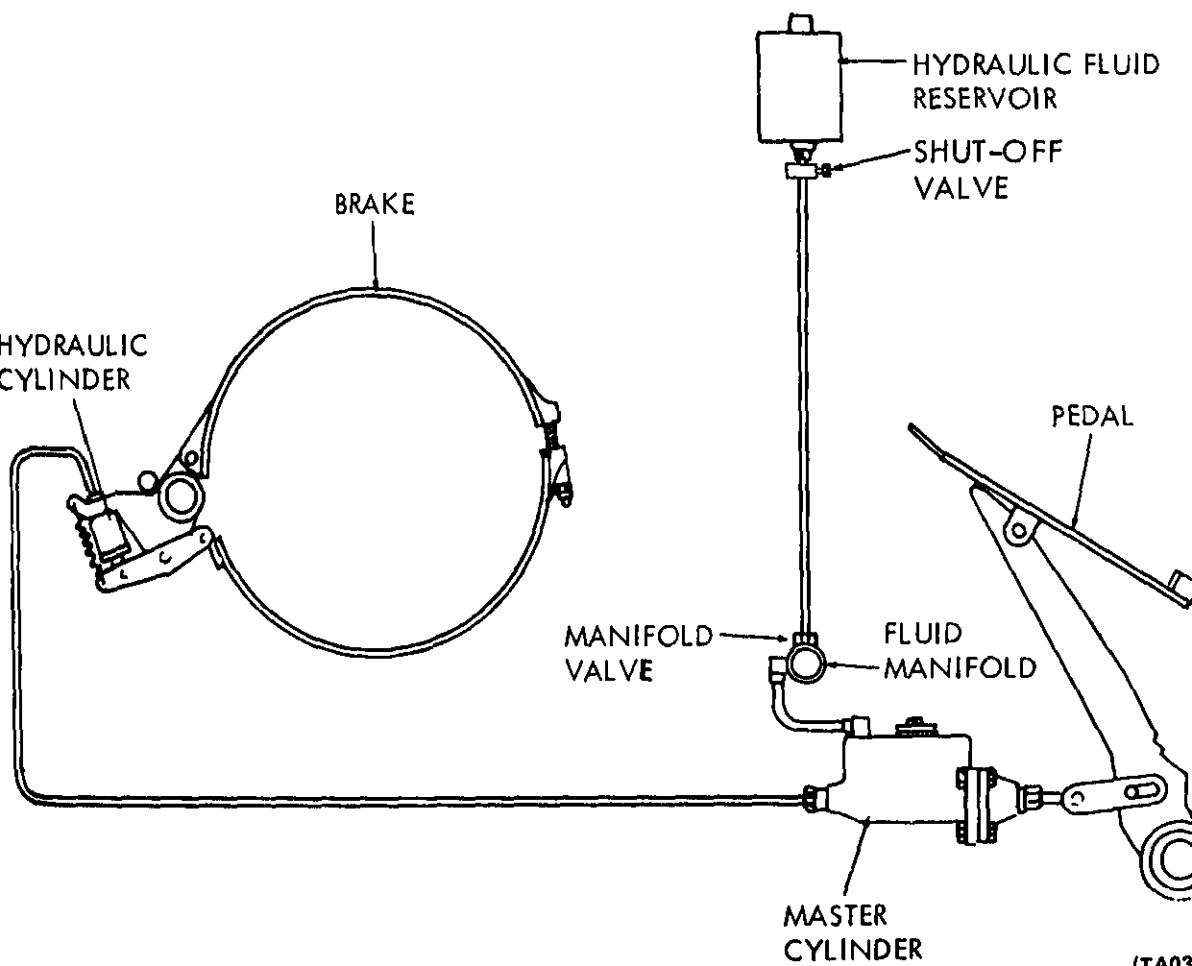
hoists, load lift and crane swing operations are hydraulically powered. The gravity feed hydraulic system (fig. 4-45) is supplied by a reservoir located in the operators compartment. From the reservoir, hydraulic fluid runs to a manifold which in turn feeds the individual master cylinders for the brakes and clutches operated by the various control levers and pedals.

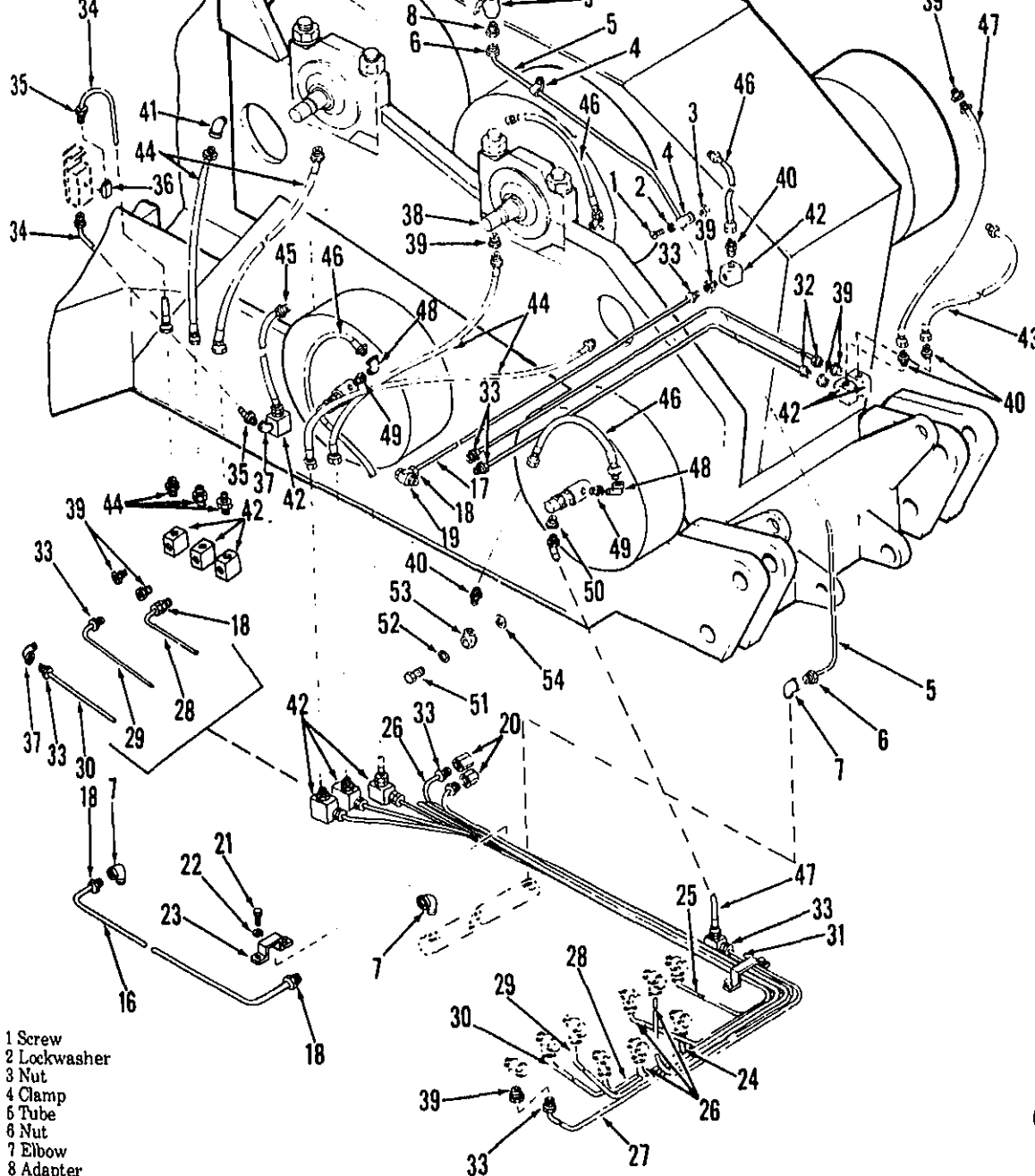
7. Hoses, Fittings and Tubing

a. Repair. Refer to figure 4-46 and tighten any loose fittings, hose or tube which is causing the hydraulic system to leak. Be sure to wipe up any spilled

clutch lining. Hydraulic fluid is a lubricant, and cause otherwise serviceable brake or clutch to slip.

b. Replacement. Close the shut-off valve in the hydraulic reservoir shown in figure 4-45. Then refer to figure 4-46 and remove and replace any worn or damaged hydraulic hose, fitting or tube. Always cap or plug each end of the hose or fitting when a part has been removed, to prevent dirt from entering the hydraulic system and to prevent the loss of unnecessary amounts of hydraulic fluid. Refill the hydraulic reservoir and bleed the system after any item in the hydraulic system has been replaced.





- 1 Screw
- 2 Lockwasher
- 3 Nut
- 4 Clamp
- 6 Tube
- 6 Nut
- 7 Elbow
- 8 Adapter
- 9 Drain cock
- 10 Bushing
- 11 Vent
- 12 Bushing
- 13 Screw
- 14 Lockwasher
- 15 Hydraulic reservoir
- 16 Tube
- 17 Tube
- 18 Inverted nut

- 19 Adapter
- 20 Coupling
- 21 Screw
- 22 Lockwasher
- 23 Clamp
- 24 Tube
- 25 Tube
- 26 Tube
- 27 Tube

- 28 Tube
- 29 Tube
- 30 Tube
- 31 Tube
- 32 Tube
- 33 Inverted nut
- 34 Tube
- 35 Inverted nut
- 36 Tube

- 37 Elbow
- 38 Swivel joint
- 39 Adapter
- 40 Adapter
- 41 Elbow
- 42 Weldment fitting
- 43 Hose
- 44 Hose
- 45 Hose brake cylinder

- 46 Hydraulic hose
- 47 Hydraulic hose
- 48 Elbow
- 49 Bushing
- 50 Adapter
- 51 Bolt
- 52 Gasket
- 53 Connector tee
- 54 Gasket fitting

follows:

(1) Fill the reservoir (fig. 4.45) with the proper fluid and check the level frequently during the following steps. Keep the reservoir full.

(2) Open the manifold valve (fig. 4-45) and allow fluid to flow into a clean jar, until no bubbles are present in the fluid coming out of the valve. Then close the manifold valve.

(3) Starting with the lower row of master cylinders, open the bleeder cap on the top of each master cylinder in turn, and bleed the fluid until no air is visible in the fluid. Close the bleeder cap.

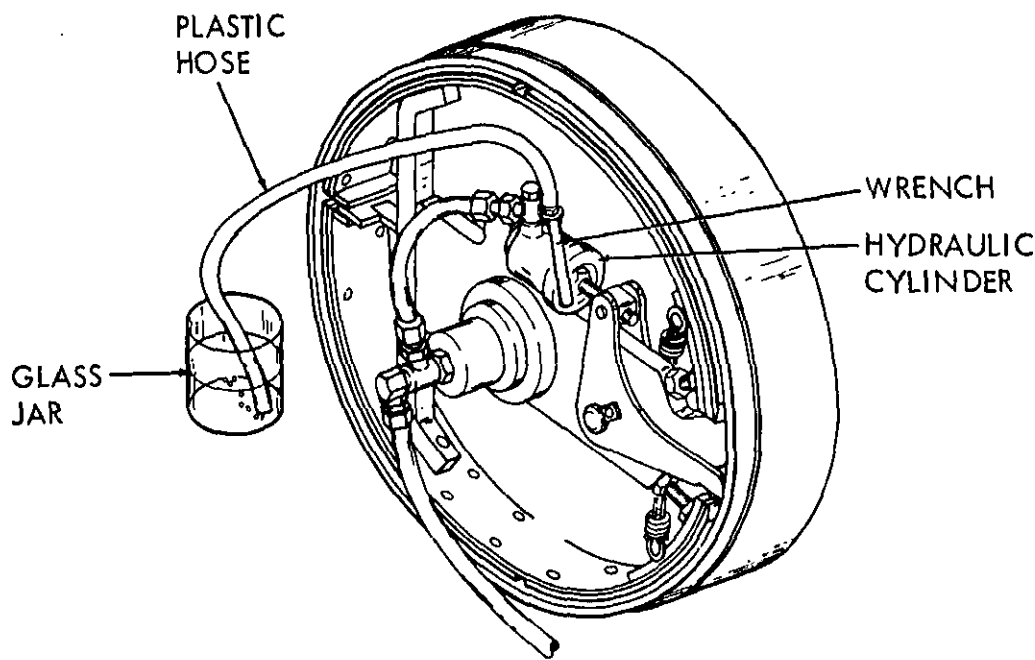
(4) Attach a clear plastic hose, to the bleed valve of the lowest clutch or brake cylinder to be bled as

system.

NOTE

Cylinder bleed fittings must be at the highest point of travel. They may be positioned by "tapping" the engine start pushbutton with the ignition switch OFF.

(5) Work each of the controls slowly and note the action of the brake or clutch. If any control still feels "spongy", slight pressure may be applied to the operating lever or pedal to assist in expelling fluid from the open bleed screw. Be sure to close the bleed screw before the lever or pedal reaches the end of its stroke or air will be sucked into the system through the bleed screw.



(TA033)

Figure 4-47. Hydraulic cylinder bleeding procedure.

8. Master Cylinders

General. Master cylinders convert the motion of a control lever or pedal into the hydraulic pressure required to activate the appropriate brake or clutch master cylinder.

Replacement. Refer to figure 4-48 and replace a master cylinder as follows:

(1) Close shut-off valve at hydraulic reservoir.

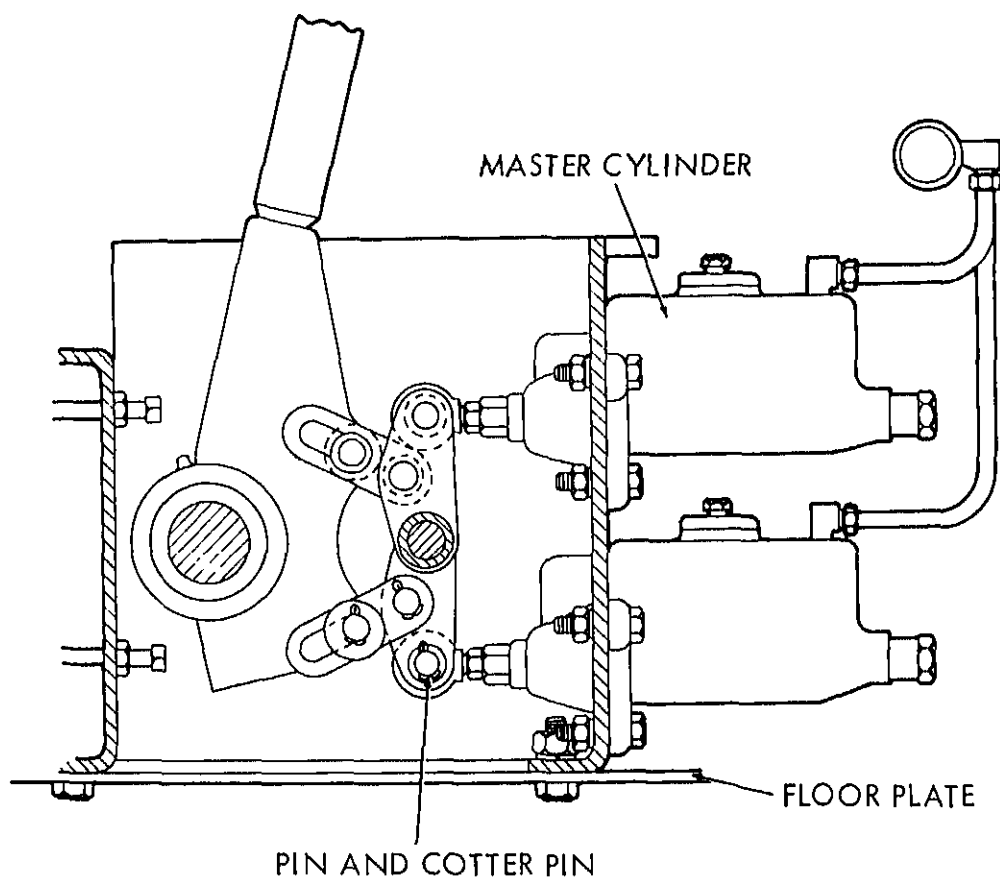
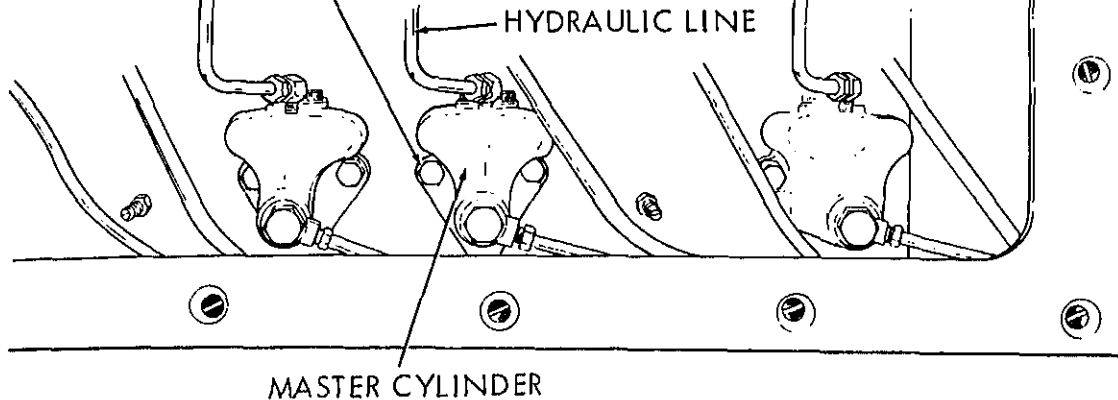
(2) Remove cab floor board over master cylinder

immediately plug tubes. Catch fluid from cylinder in a clean container.

(5) Remove pin and cotter pin connecting control lever or pedal to cylinder.

(6) Remove capscrews, lockwashers and mounting cylinder to cab.

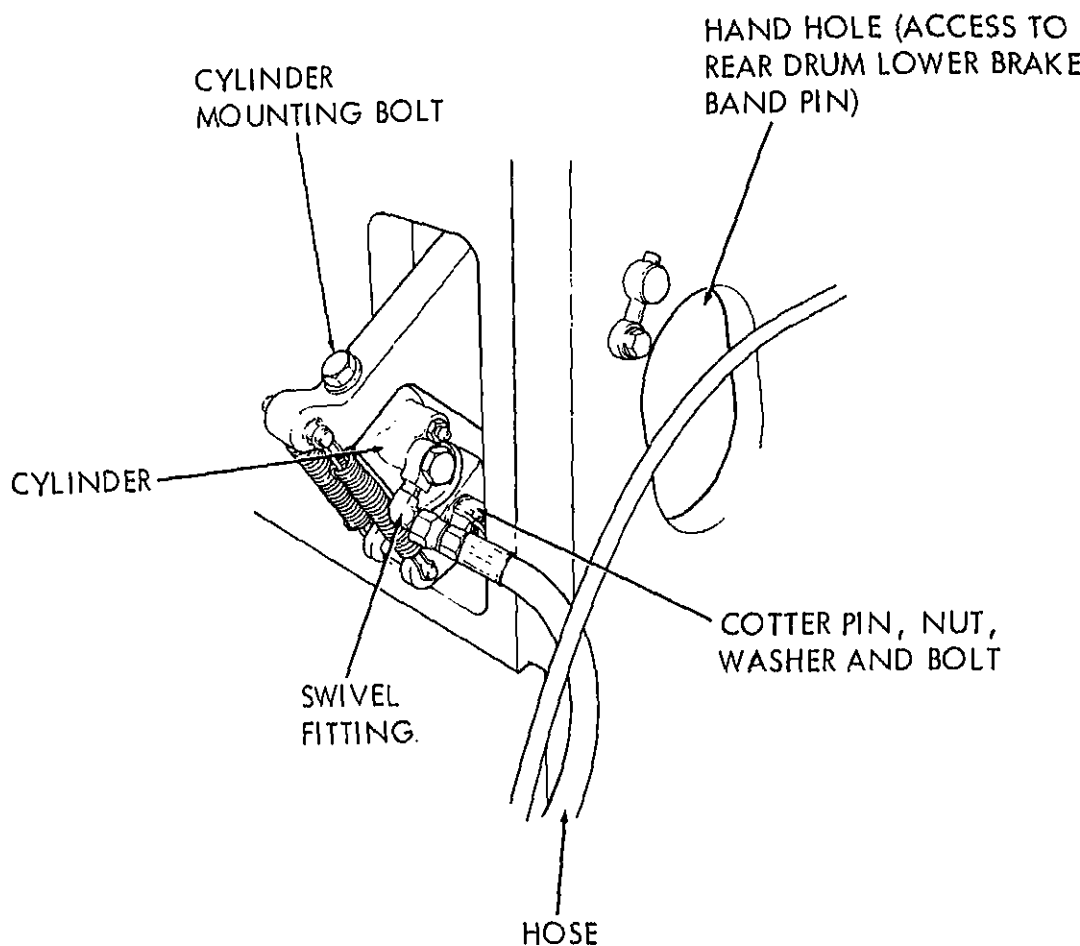
(7) Replace cylinder and secure with mounting hardware.



- STEP 1. CLOSE HYDRAULIC SHUT-OFF VALVE (FIG. 4-45).
- STEP 2. REMOVE FLOOR PLATE COVERING MASTER CYLINDERS.
- STEP 3. REMOVE PIN AND COTTER PIN AT INSIDE CONTROL MASTER CYLINDER CONNECTION.
- STEP 4. DISCONNECT HYDRAULIC LINES AT TUBE NUTS AND PLUG LINES

are identical. Close the hydraulic shut-off valve. Then refer to figure 4-49 and remove and re-

ton with the ignition switch in the OFF



STEP 1. CLOSE HYDRAULIC SHUT-OFF VALVE (FIG. 4-50).

STEP 2. DISCONNECT HOSE AT SWIVEL FITTING. PLUG HOSE IMMEDIATELY.

STEP 3. REMOVE COTTER PIN, NUTS, WASHERS AND BOLTS.

STEP 4. REMOVE CYLINDER MOUNTING BOLT. REMOVE CYLINDER.

ane control system. It also allows air trapped in
nes to vent from the system. It must be kept
to the full mark at all times.

Service. Service consists of keeping the hyd-
reservoir full of clean fluid of the type specified
art L05-3810-295-12.

(2) Remove tube by loosening tube nut and
tube.

(3) Remove mounting screws and washer
move reservoir.

(4) Replace reservoir and reconnect tube.

(5) Open valve and bleed tube at manifold

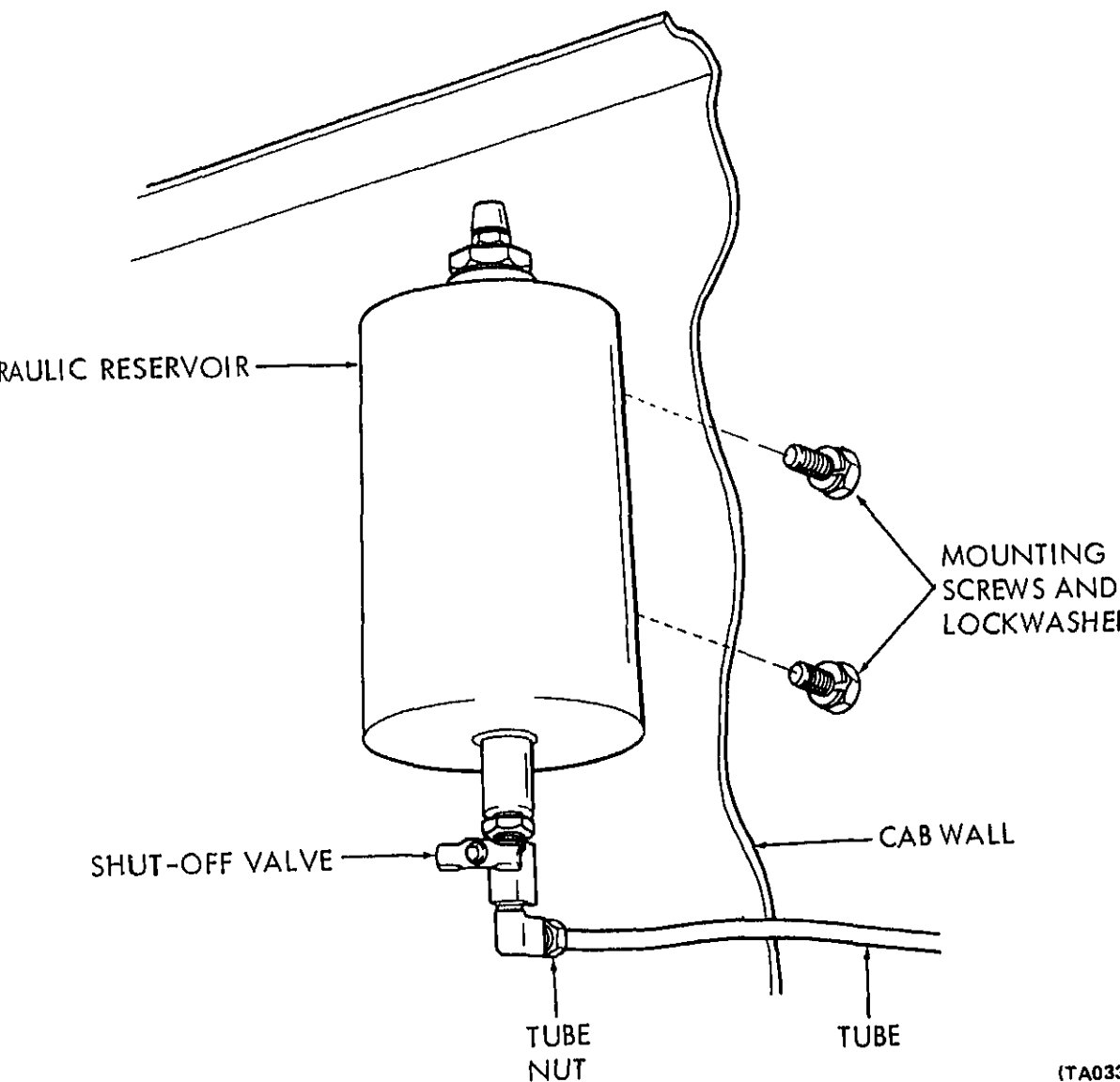
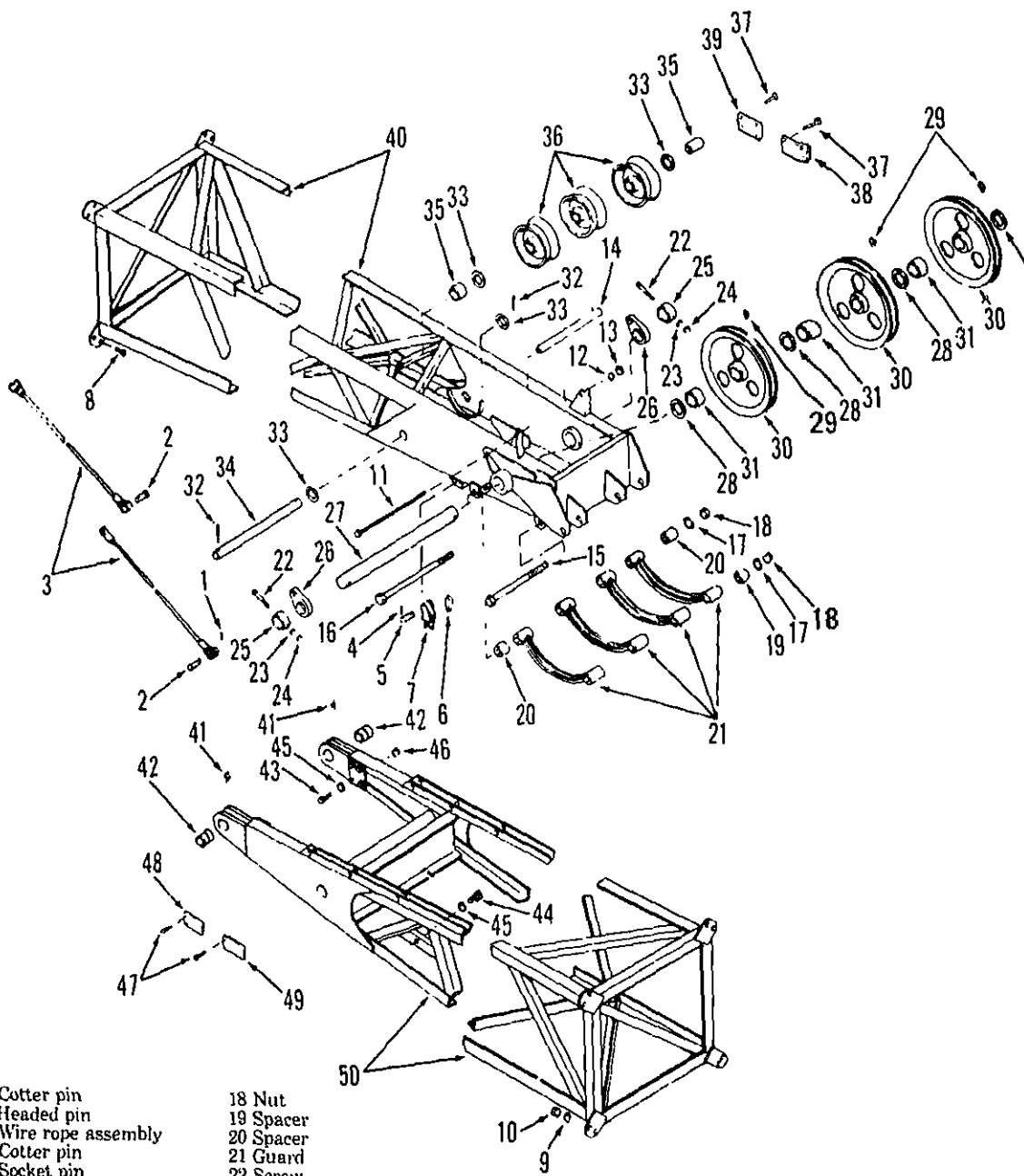


Figure 4-50. Hydraulic reservoir, replacement.

b. Replacement. Replace damaged boom components as follows:



- 1 Cotter pin
- 2 Headed pin
- 3 Wire rope assembly
- 4 Cotter pin
- 5 Socket pin
- 6 Wedge
- 7 Socket
- 8 Screw
- 9 Lockwasher
- 10 Nut
- 11 Bolt
- 12 Lockwasher
- 13 Nut

- 18 Nut
- 19 Spacer
- 20 Spacer
- 21 Guard
- 22 Screw
- 23 Lockwasher
- 24 Nut
- 25 Collar
- 26 Link
- 27 Shaft
- 28 Thrust washer
- 29 Lubrication fitting

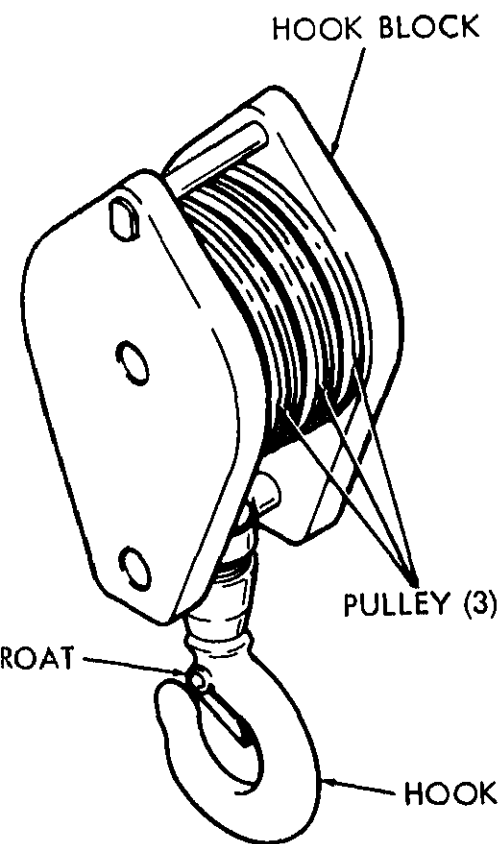
- 35 Spacer
- 36 Roller
- 37 Rivet

- 43 Screw
- 44 Screw

signs of damage. Inspect pulleys for cracks or excessive wear. Inspect hook for signs (widened throat) of excessive stress.

Service. Lubricate the hook block as described in paragraph 4-30-295-12.

Replacement. Lower boom to rest on cribbing. Remove hook block on suitable blocking. Note the cable arrangement on block pulleys. Disconnect cable at hook. Remove hook block and replace. Reeve hook and dead end cable as described in paragraph 4-30-295-12.



(TA033025)

Figure 4-52. Hook block assembly.

Boom Backstop

b. Replacement. Refer to figure 4-53 and remove boom backstop as follows:

(1) Lower boom to rest on suitable cribbing.

(2) Attach a suitable sling and hoist to back of boom backstop. Remove pins connecting backstop assembly to boom and brackets. Remove brackets if damaged.

(3) Replace brackets, if removed using a hoist. Position new backstop and secure using pins and cotter pins.

4-65. Upper Spreader

a. General. The upper spreader contains sheaves for the boom hoist cable and provides a point of attachment for boom guy cables. The upper spreader is sometimes called the bridle assembly.

b. Service. Lubricate upper spreader as described in paragraph 4-30-295-12.

c. Replacement. Replace upper spreader as follows:

(1) Lower boom to rest on suitable cribbing. Refer to figure 4-3. Relieve tension on boom hoist cable.

(2) Support spreader in such a manner so that it will not slip when the boom hoist cable and guy cables are removed and spreader won't slip off boom.

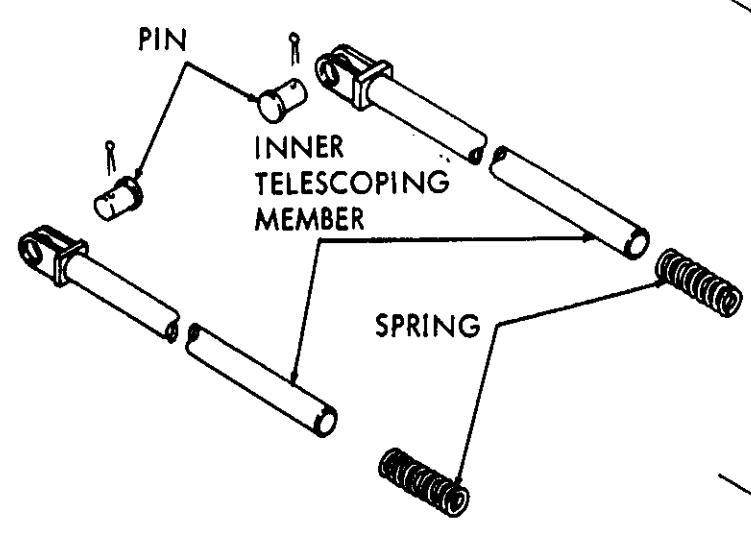
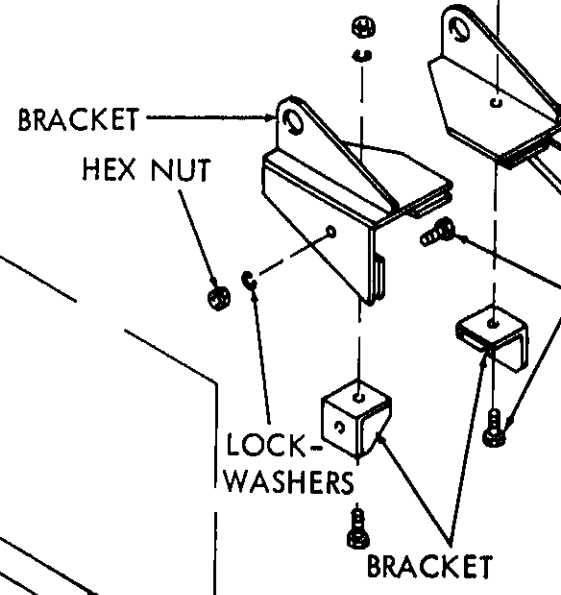
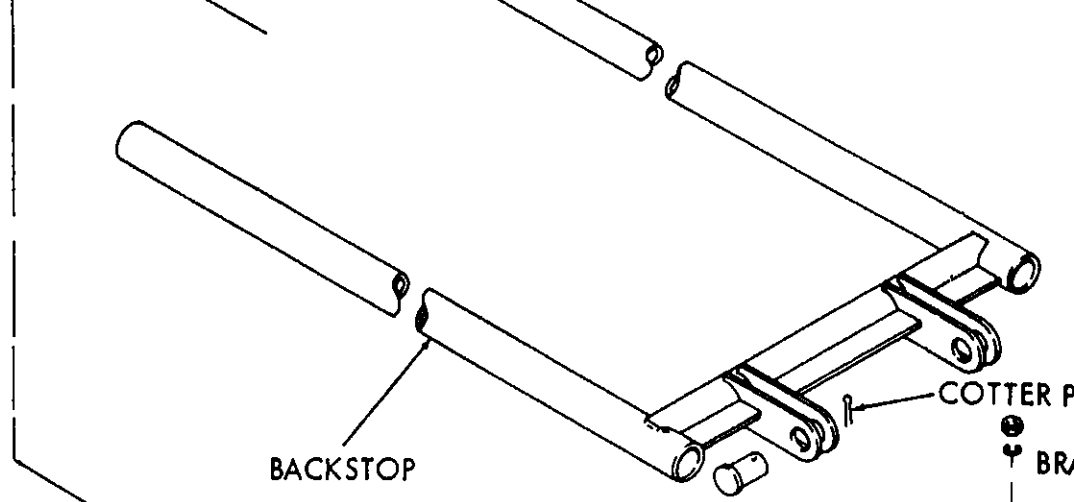
(3) Disconnect boom hoist cable from dead end and take in cable. Disconnect guy cable pins from spreader. Using a hoist remove and replace upper spreader.

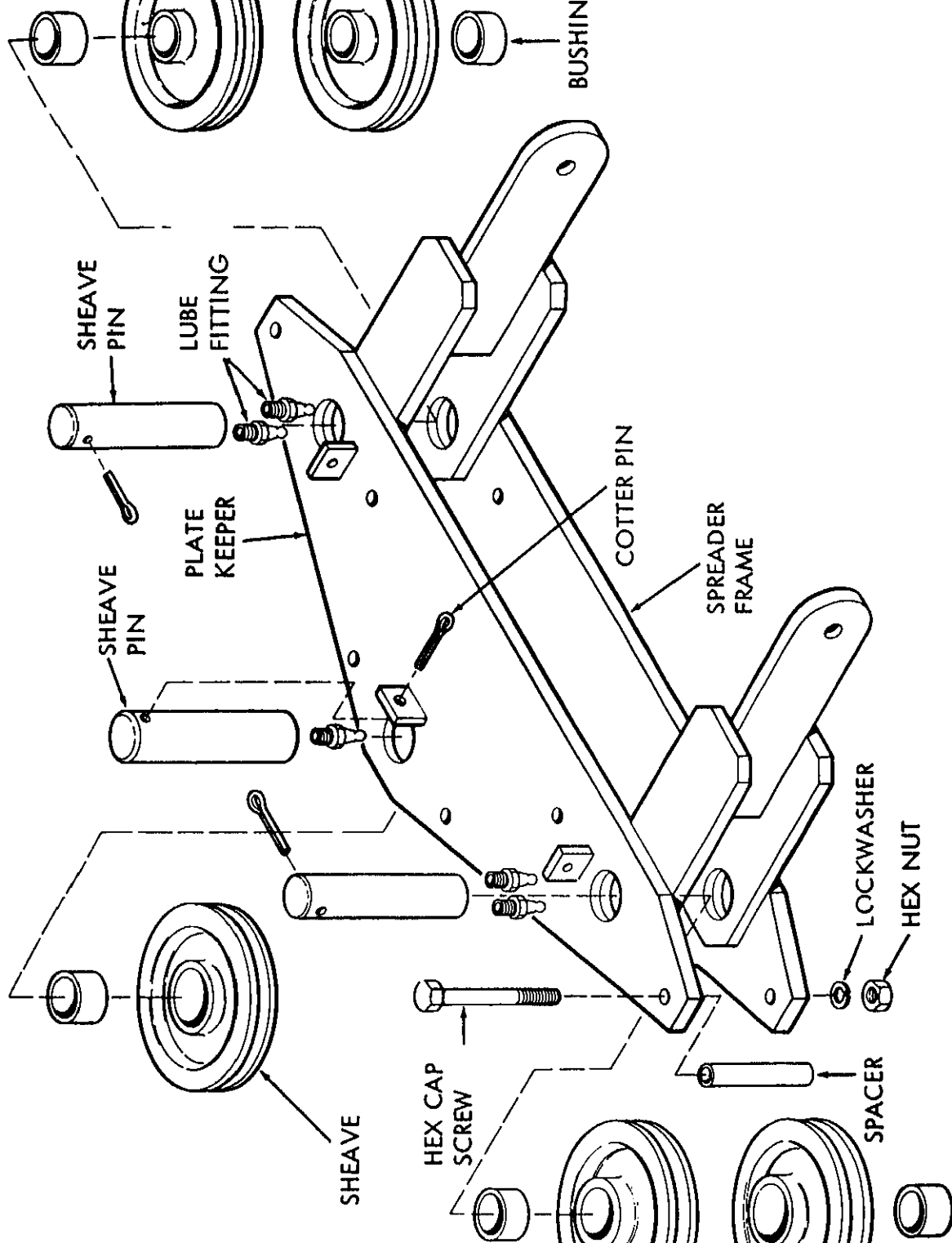
(4) Reconnect guy cables and reeve hoist cable as described in paragraph 4-7.

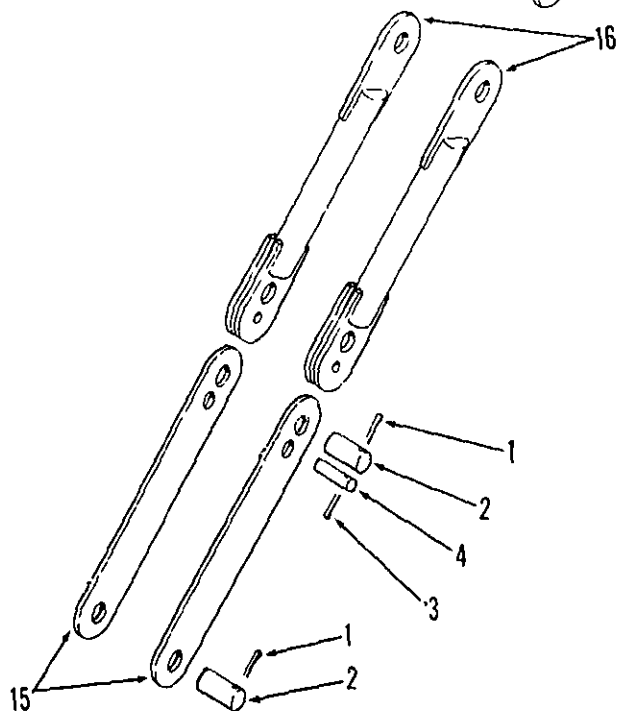
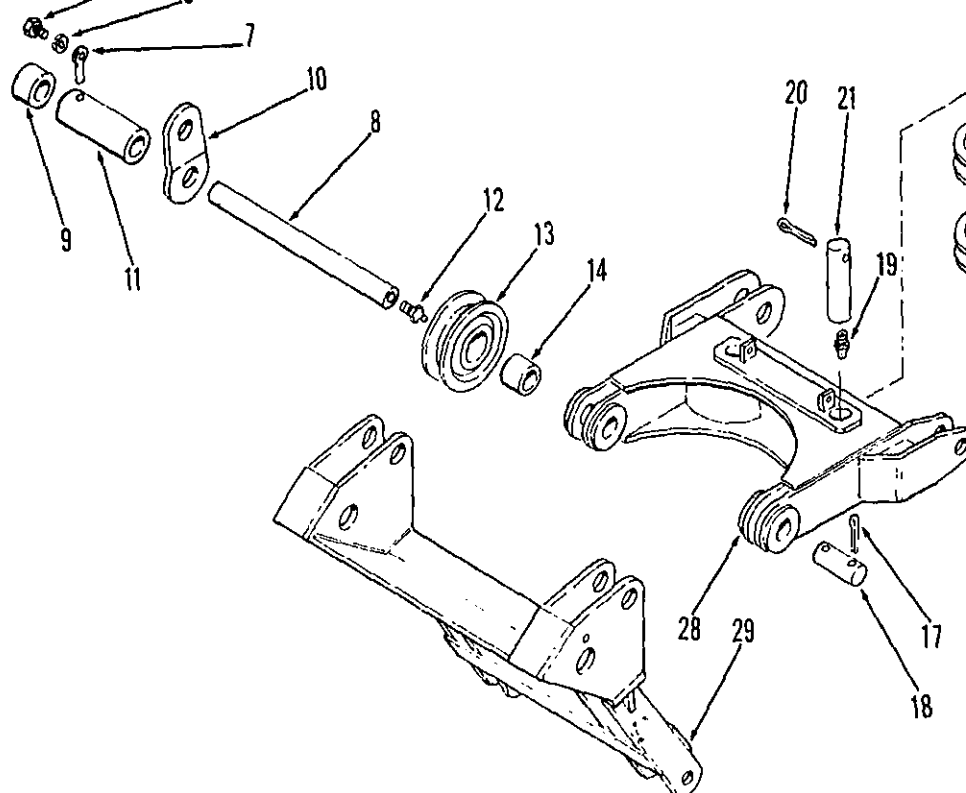
NOTE

A properly grooved sheave has smooth side walls and the groove is only slightly wider than the scale. Use a light layer of lubricant when reinstalling pins, bushings, and other fitted parts. Be sure lubrication fittings are properly installed and line up with grease holes.

d. Repair. Refer to figure 4-54. Carefully inspect sheave bushings for signs of wear or damage and replace damaged bushings. Inspect sheave for wear, grooving, or cracks, and replace worn or aged sheaves. Inspect sheave pins for wear or damage and smooth small rough points with a fine emery cloth. Replace severely worn or scored pins. Clean sheaves with a proper solvent, removing all lubricant. Inspect lubrication fittings and make







- 1 Cotter
- 2 Straight
- 3 Cotter
- 4 Straight
- 5 Screw
- 6 Lock
- 7 Rod
- 8 Shaft
- 9 Space
- 10 Link
- 11 Space
- 12 Lubr
- 13 Pulle
- 14 Sleeve
- 15 Mem
- 16 Mem
- 17 Cotter
- 18 Strai
- 19 Lubr
- 20 Cotter
- 21 Strai
- 22 Pulle
- 23 Sleeve
- 24 Cotter
- 25 Strai
- 26 Wed
- 27 Sock
- 28 Fram
- 29 Mem

General

Every case where clutches or brake bands are to be moved or replaced, safety requires that the load supported by the clutch or brake be lowered to the ground. Specifically, always lower the boom to the ground or cribbing when the boom hoist clutch or brake are to be worked upon. Lower the loads to the ground before working on front or rear drum brakes or clutches. Secure the revolving frame from turning before working on the swing brake or swing brake

Front and Rear Drumshaft Brake and Clutch

General. Always adjust (Chapter 3) a brake or clutch which has been removed before returning the crane to operation. The rear drumshaft brake is used to hold the load on the rear drum load line. The clutch engages the load to the drum.

Brake Band Replacement. Refer to figure 4-56 to remove or replace the rear drum brake band.

Clutch Band Replacement. Refer to figure 4-57 to remove or replace the rear drumshaft clutch band. Position the band as required by "tapping" the clutch start pushbutton with ignition switch in the "on" position.

Boom Hoist Brake and Clutch

General. The boom hoist brake is spring-set hydraulically released. Always lower the boom to the ground before adjusting or working on the brake or clutch.

Brake Band Removal. The boom hoist brake band is removed as an assembly. To remove the assembly, remove items 1 through 7 of figure 4-58. The entire assembly can then be removed to the ground for complete disassembly as shown. Unscrew the threaded end of the lower brake band from the boom hoist rod to complete removal of the brake band. Note that the phantom pin on figure 4-58 is attached to the revolving frame side frame and can not be removed.

Clutch Replacement. Refer to figure 4-59 and remove and replace clutch as shown.

Swing Brake

crane from turning. It is not used to stop the crane once it is in motion.

b. Replacement of Brake Shoes. Refer to figure 4-60 and remove or replace swing brake shoes. Engage the swing brake mechanical lock to prevent the upper from turning.

4-72. Drive Chains

a. General. The removal and replacement procedures for each drive chain are given in the following paragraphs.

b. Reversing Shaft Chain. Refer to figure 4-61 to remove the reversing shaft chain.

c. Rear Drum Chain. Refer to figure 4-62 and remove the rear drum chain case. Then refer to figure 4-63 and remove the rear drum chain.

d. Horizontal Swing Shaft Chain. Refer to figure 4-64 and remove the horizontal swing shaft chain.

4-73. Hook Rollers

a. General. Hook rollers are provided to prevent the crane from tipping in relation to the carrier. They prevent damage to the machine, while improving machine stability.

b. Removal. Refer to figure 4-65 and remove the hook rollers. There is a single hook roller at the front of the revolving frame, as shown in figure 4-65. A double hook roller of identical design is used at the rear of the revolving frame. Removal and replacement procedures are the same.

c. Adjustment. Refer to figure 4-66 and adjust the hook rollers if clearance between rollers and roller guides exceeds one-sixth of an inch.

4-74. Swing Lock Assembly

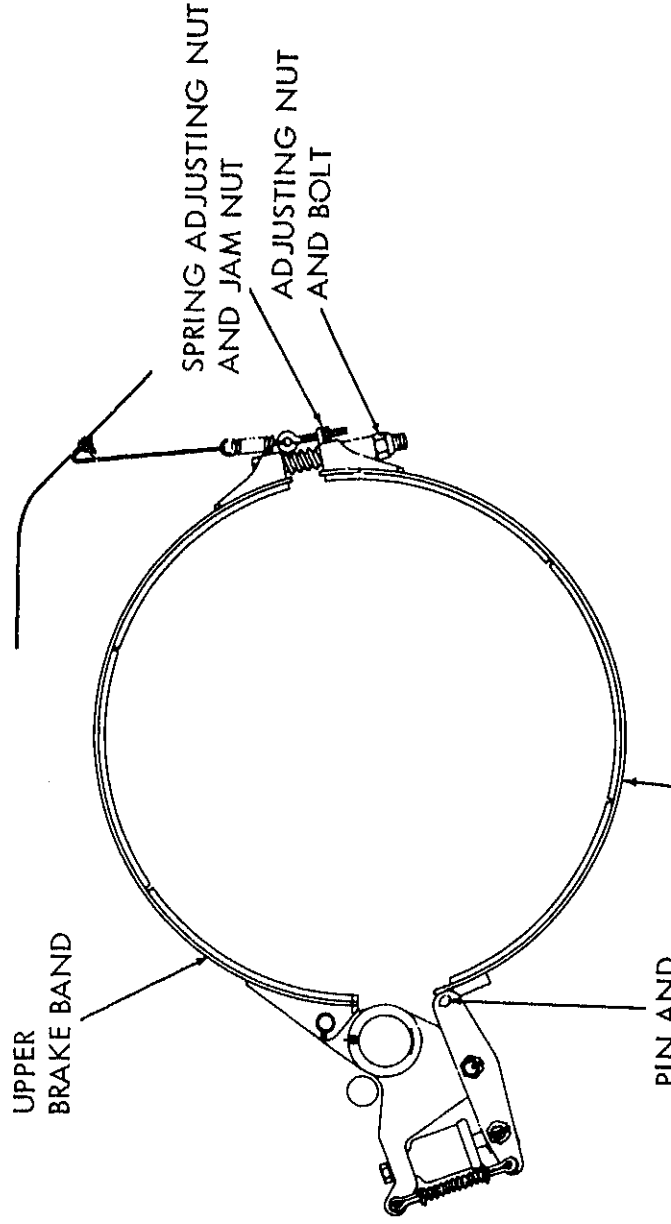
a. General. The swing lock assembly mechanism prevents the revolving frame from moving in relation to the carrier.

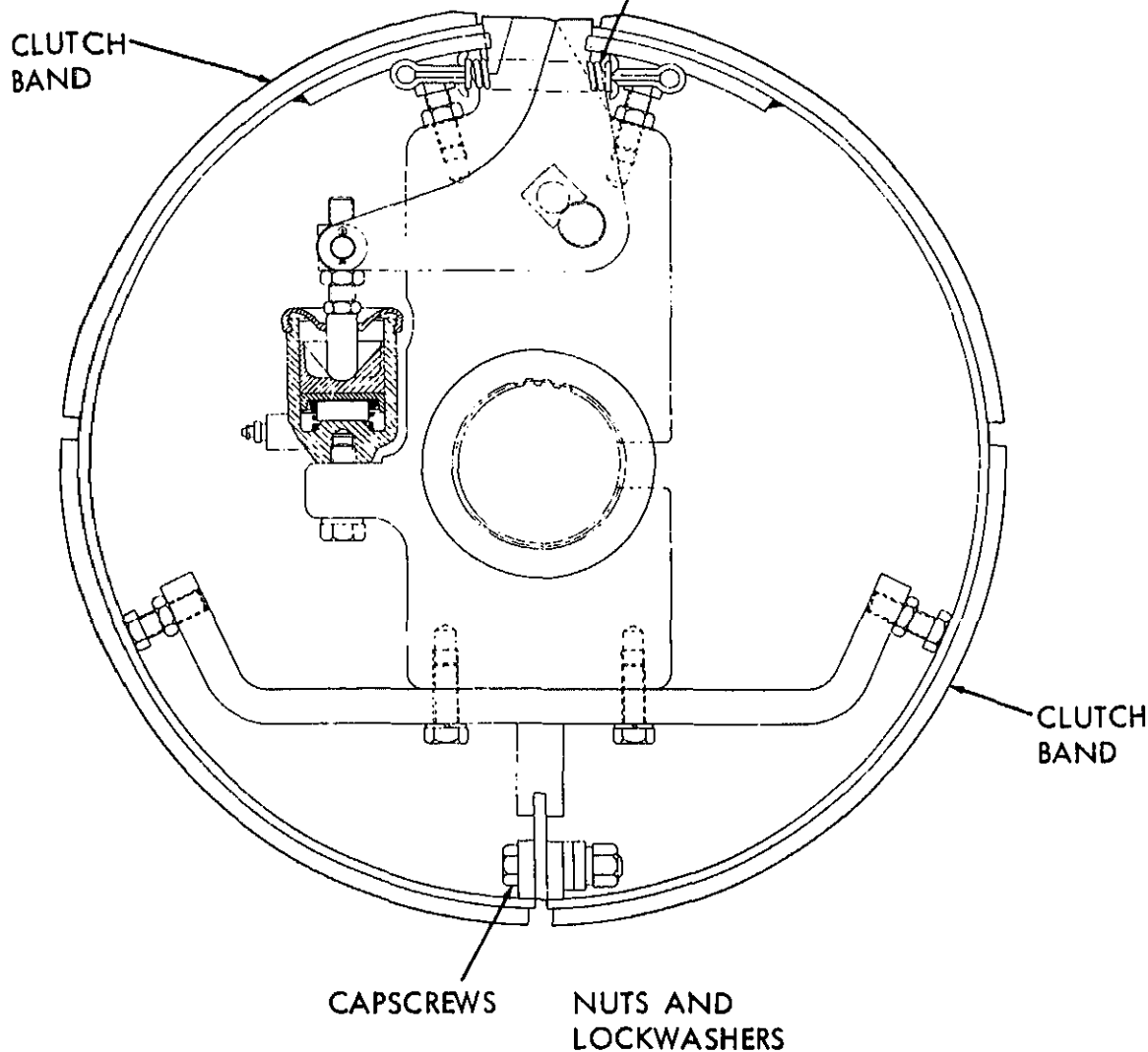
b. Adjustment. Remove deck plates as required to obtain access to the swing lock assembly. Refer to figure 4-67 and adjust the swing lock assembly. The swing lock does not properly engage the swing gear.

c. Removal. Refer to figure 4-67 and remove the cotter pins and pins identified to remove the swing lock assembly.

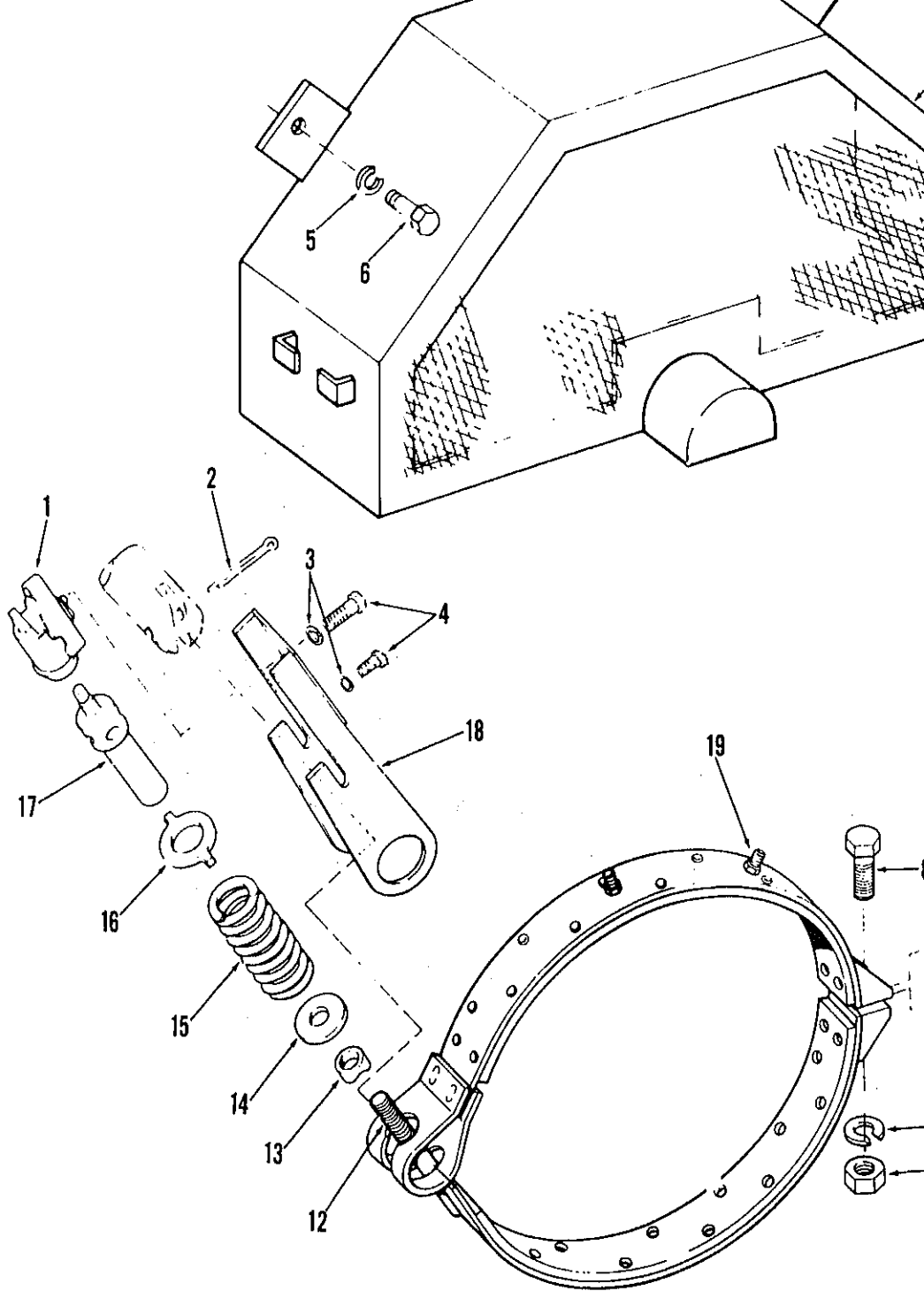
4-75. Pawls

- STEP 1. LOWER LOAD ON FRONT OR REAR DRUM LINE TO GROUND.
- STEP 2. REMOVE ADJUSTING NUT AND ADJUSTING BOLT.
- STEP 3. REMOVE COTTER PIN AND UPPER BRAKE BAND PIN. THESE PINS ARE REACHED FROM BEHIND REAR DRUM. REMOVE UPPER BRAKE BAND.
- STEP 4. REFER TO FIGURE 4-49 AND REMOVE LOWER BRAKE BAND COTTER PIN AND PIN THROUGH HAND HOLE.
- STEP 5. REMOVE SPRING ADJUSTING NUT AND JAM NUT. SLIDE LOWER BRAKE BAND AROUND DRUM AND REMOVE LOWER BRAKE BAND.
- STEP 6. REMOVE FRONT DRUM BRAKE BAND IN SAME MANNER.

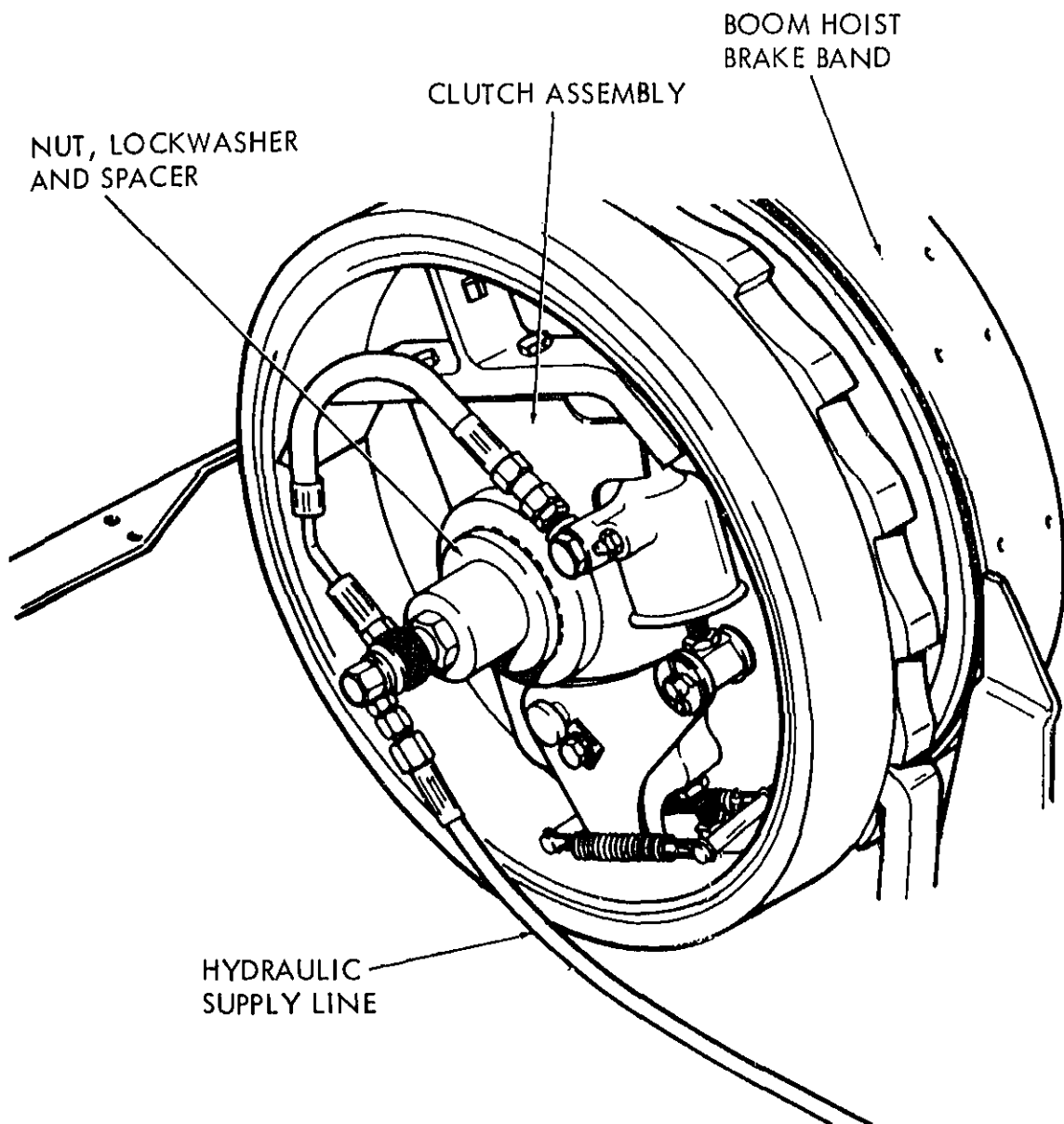




- STEP 1. LOWER LOAD TO GROUND.
- STEP 2. BE SURE IGNITION SWITCH IS IN OFF POSITION. REMOVE SPRINGS.
- STEP 3. USE ENGINE START PUSHBUTTON TO POSITION CLUTCH BAND WITH BAND SPLIT CAPSCREWS JUST ABOVE SIDESTAND. REMOVE CAPSCREWS AND SPLIT BAND.
- STEP 4. REMOVE UPPER CLUTCH BAND.
- STEP 5. TAP ENGINE START PUSHBUTTON TO POSITION OTHER CLUTCH BAND ON TOP. REMOVE OPPOSITE CLUTCH BAND.



SHAFT AS A UNIT.

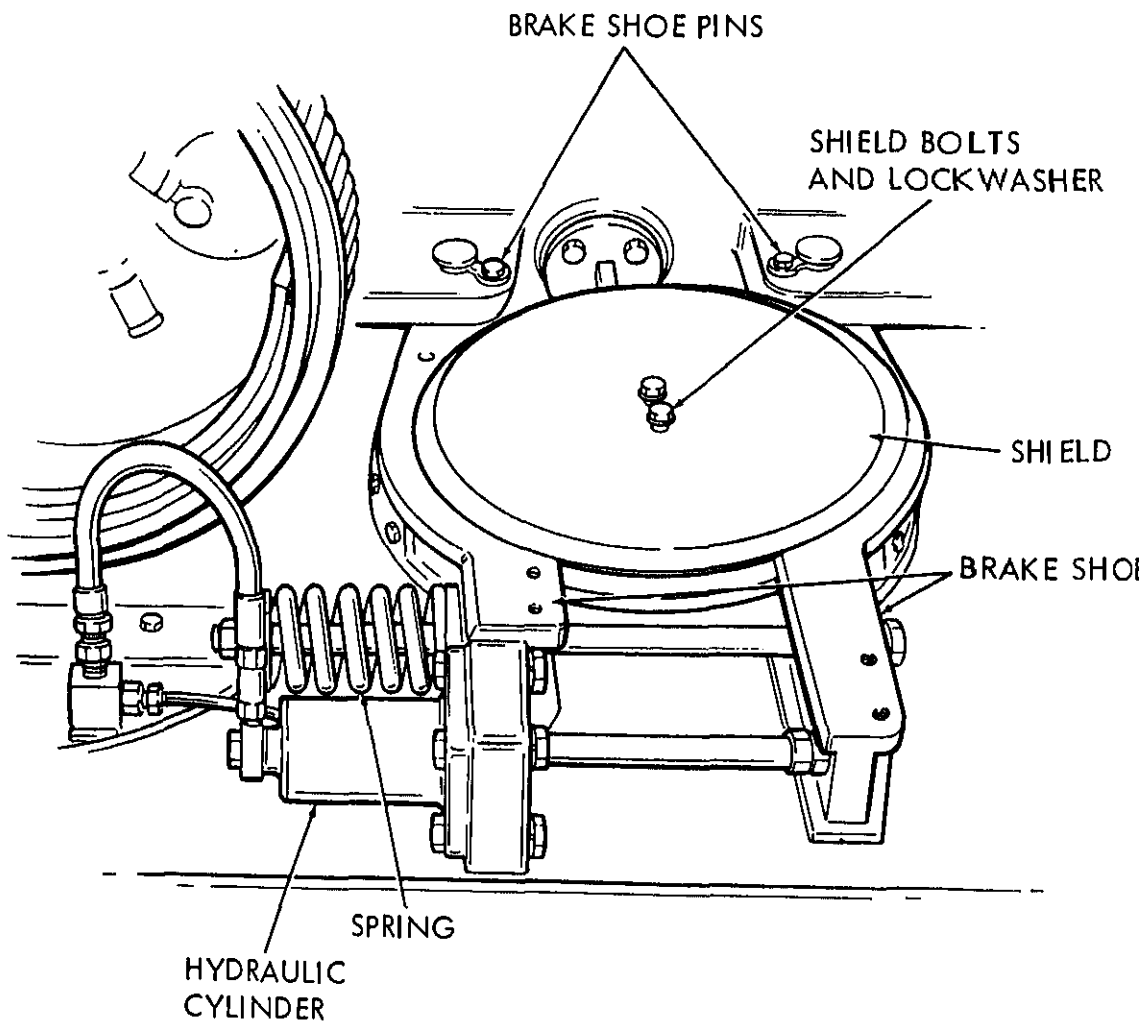


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Figure 4-59. Boom hoist clutch, replacement.

- STEP 2. PLACE SPRING BRAKE LEVER IN RELEASED POSITION.
- STEP 3. REMOVE SHIELD BOLTS AND LOCKWASHERS AND REMOVE SHIELD.
- STEP 4. REMOVE BOLTS AND LOCKWASHERS, ROD ENDS, AND BRAKE SHOE PINS AT END OF EACH BRAKE SHOE.
- STEP 5. REMOVE JAM NUT AND NUT FROM SPRING.
- STEP 6. REMOVE BRAKE SHOES WITH SPRING AND HYDRAULIC CYLINDER ATTACHED TO LEFT BRAKE SHOE.

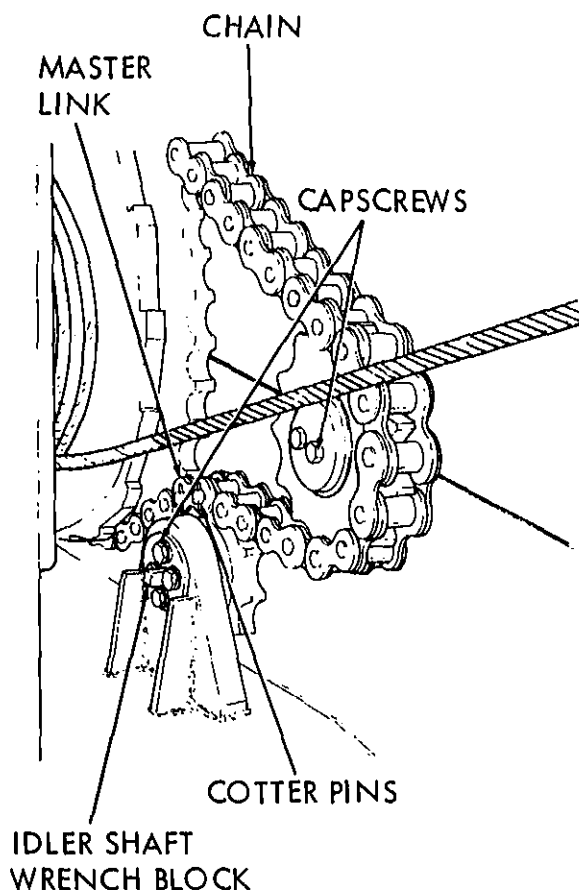
NOTE: SHIMS ARE USED BENEATH BRAKE SHOE PINS. REPLACE SHIMS IN SAME LOCATIONS.



AN EXPOSED POSITION
AS REQUIRED.

STEP 3. LOOSEN CAPSCREWS AND
PLACE WRENCH ON EC-
CENTRIC IDLER SHAFT
WRENCH BLOCK. TURN
BLOCK TO LOOSEN
CHAIN.

STEP 4. REMOVE COTTER PINS AND
DRIVE MASTER LINK PINS
OUT. DISCONNECT THE
TWO ENDS AND REMOVE
THE CHAIN.



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Figure 4-61. Reversing shaft chain, replacement.

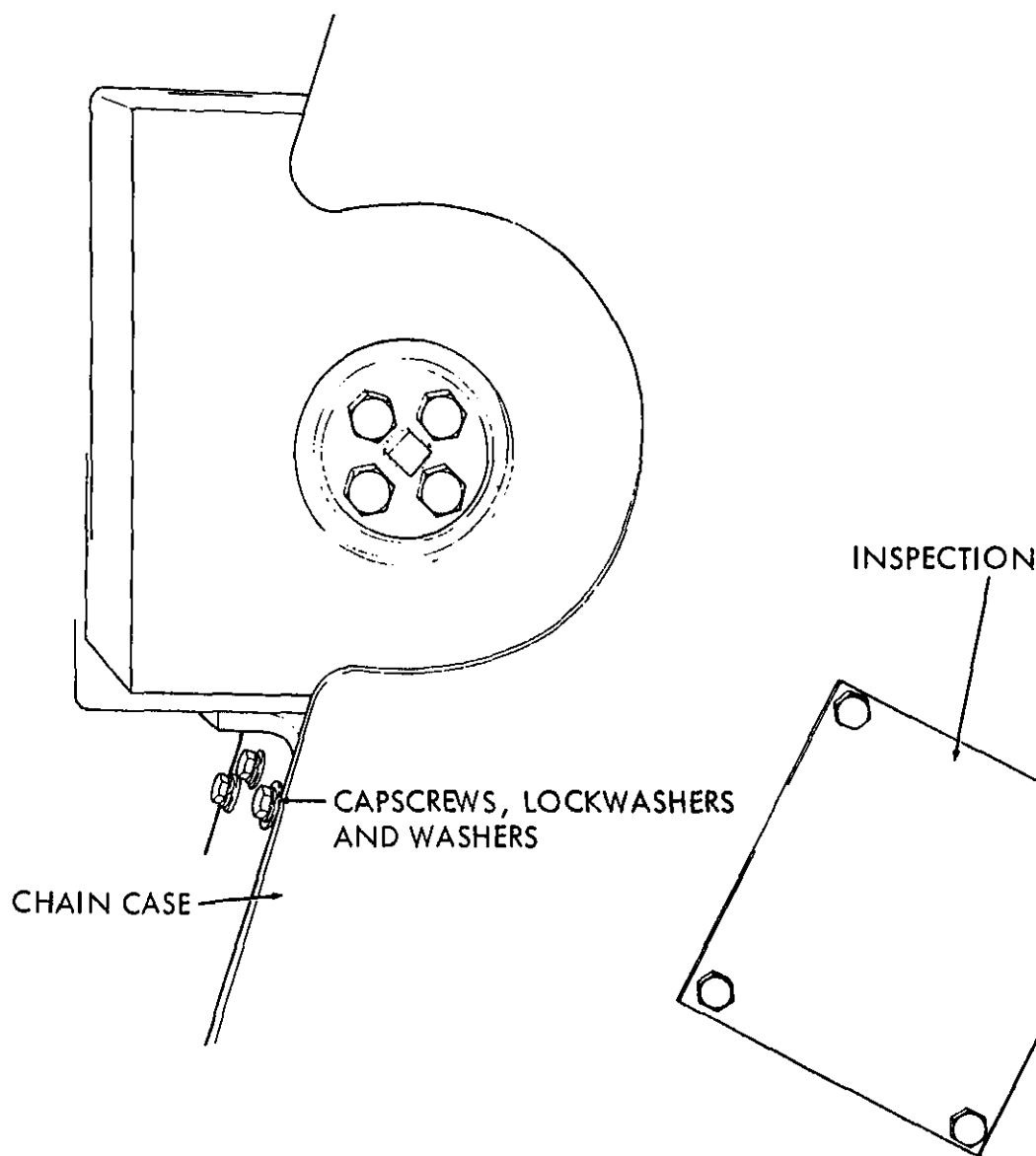


Figure 4-62. Rear drum chain case, replacement.

CAPSCREW

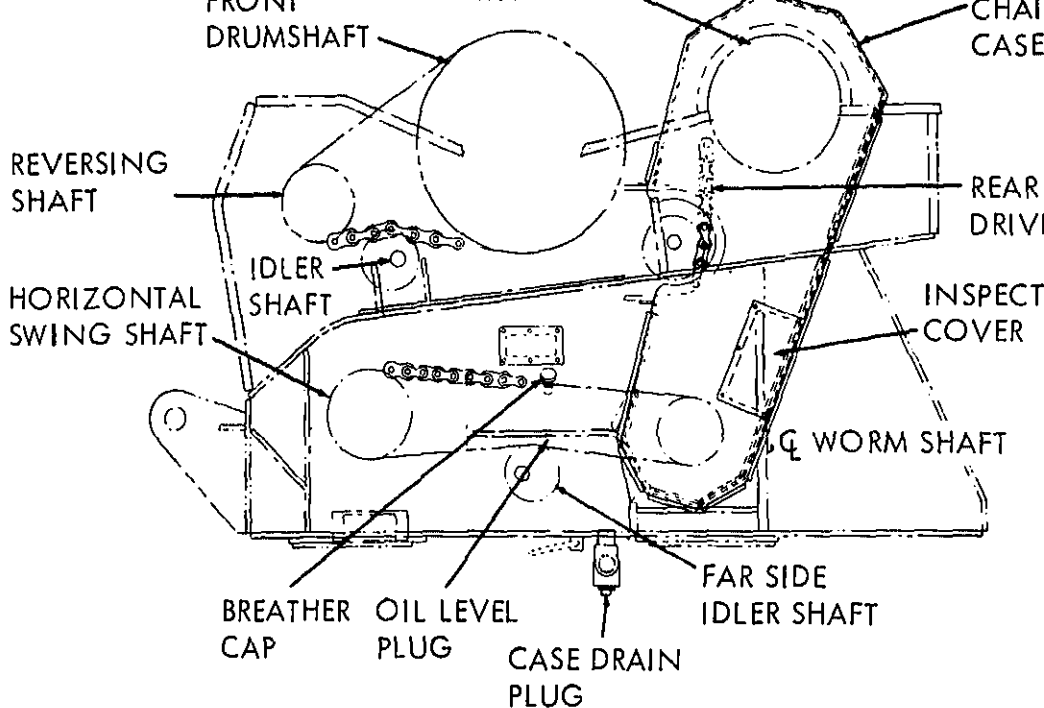
ECCENTRIC SHAFT
WRENCH BLOCK

CHAIN

MASTER
LINK

MASTER LINK
PINS AND
COTTER PINS

- P 1. LOCATE THE CHAIN MASTER LINK.
- P 2. LOOSEN CAPSCREWS AND PLACE WRENCH ON ECCENTRIC SHAFT WRENCH BLOCK. TURN ECCENTRIC SHAFT TO LOOSEN CHAIN.
- P 3. REMOVE COTTER PINS AND DRIVE OUT MASTER LINK PINS, DISCONNECT THE TWO ENDS AND REMOVE CHAIN.



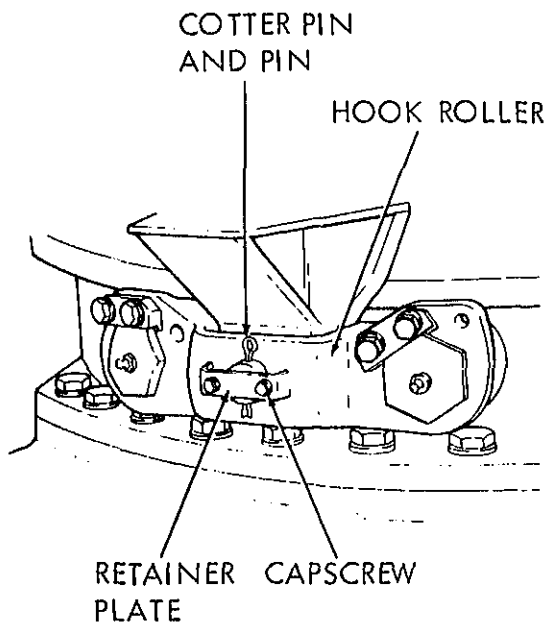
- STEP 1. TURN REVOLVING FRAME SO MAIN GEARCASE DRAIN LINES U
HOLE IN FRAME.
- STEP 2. REMOVE CASE DRAIN PLUG. HAVE AN ADEQUATE CONTAINER
CASE OIL.
- STEP 3. REMOVE INSPECTION COVER.
- STEP 4. REFER TO FIGURE 4-63 FOR VIEW OF MASTER LINK. LOCATE M
LINK AND DRIVE OUT LINK PINS. REMOVE CHAINS.

Figure 4-64. Horizontal swing shaft chain, replacement.

REVOLVING FRAME AND CARRIER
AT OPPOSITE END OF REVOLVING
FRAME.

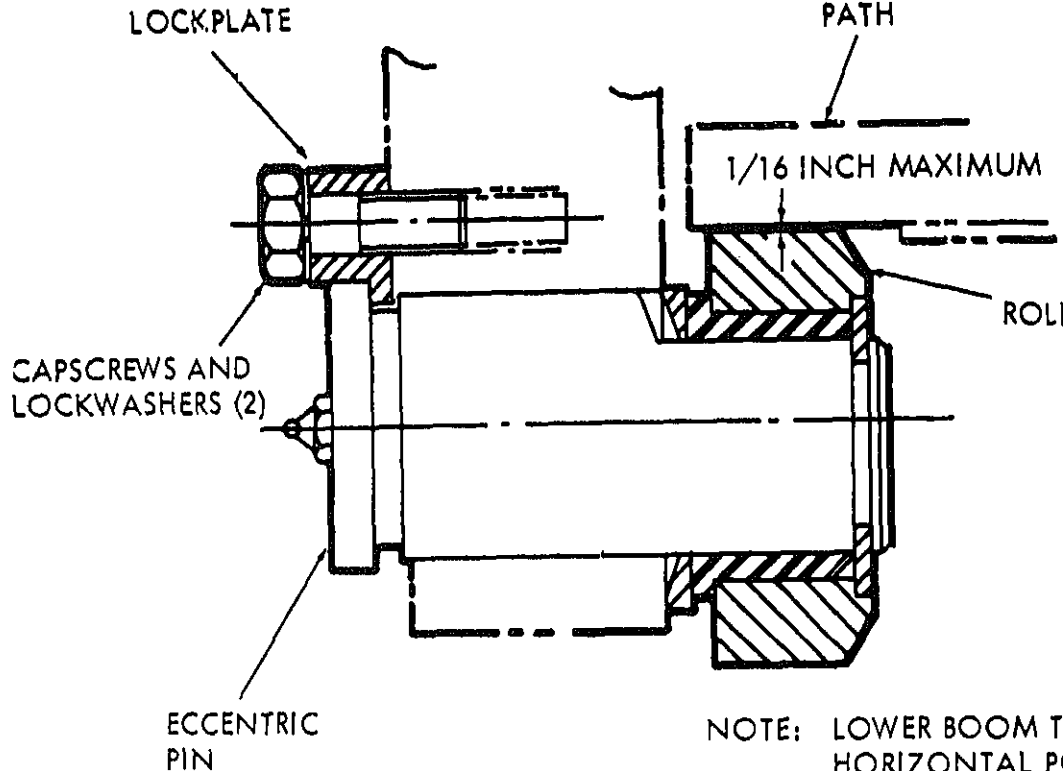
STEP 2. REMOVE RETAINING PLATE
CAPSCREWS, RETAINER PLATE,
COTTER PIN, AND PIN.

STEP 3. REMOVE HOOK ROLLER.



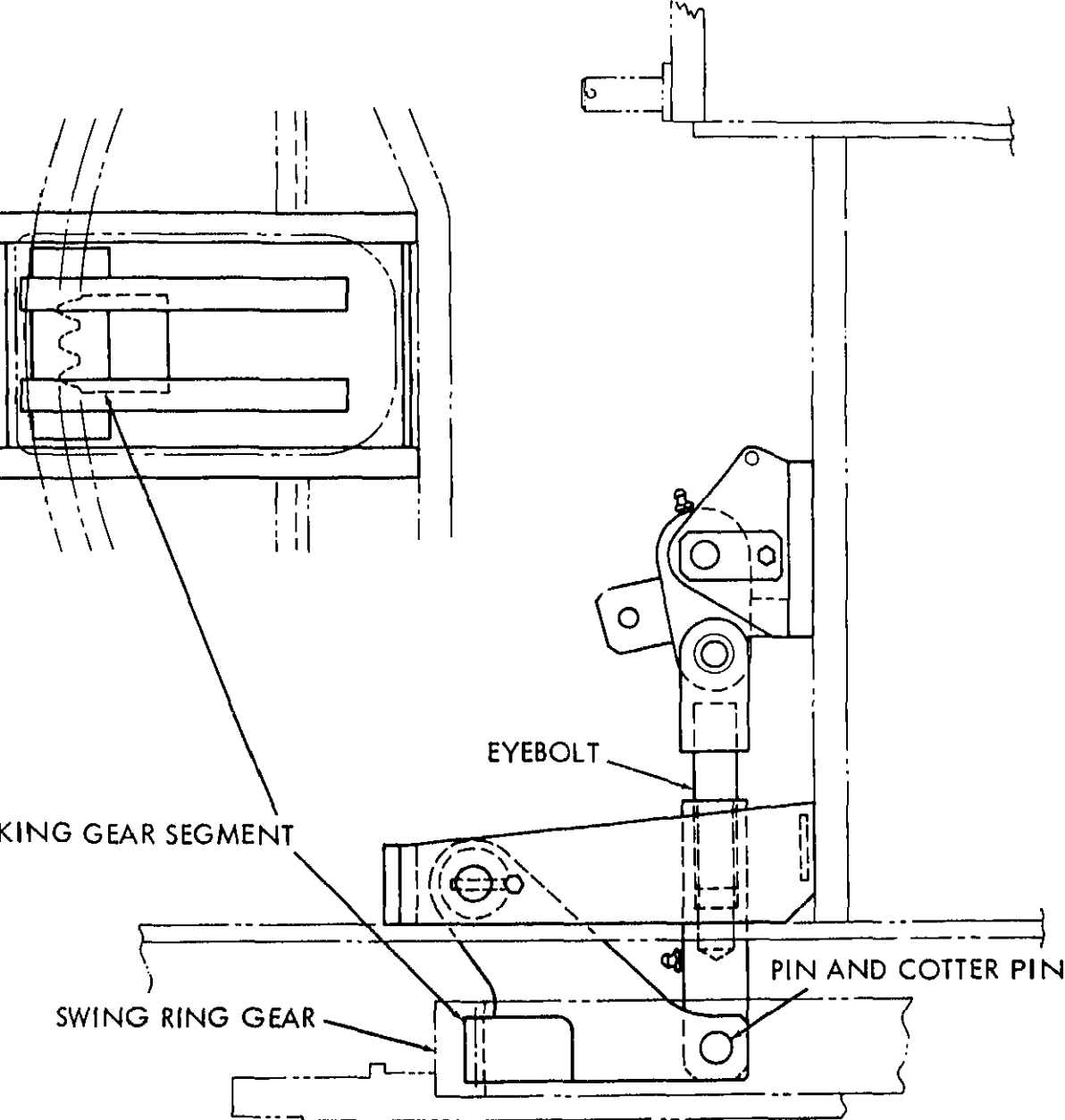
(TA033038)

Figure 4-65. Hook roller, replacement.



NOTE: LOWER BOOM TO
HORIZONTAL POSITION
TO ADJUST FROM
ROLLER. REST BOOM
BLOCKS WHEN
ING REAR HOOK.

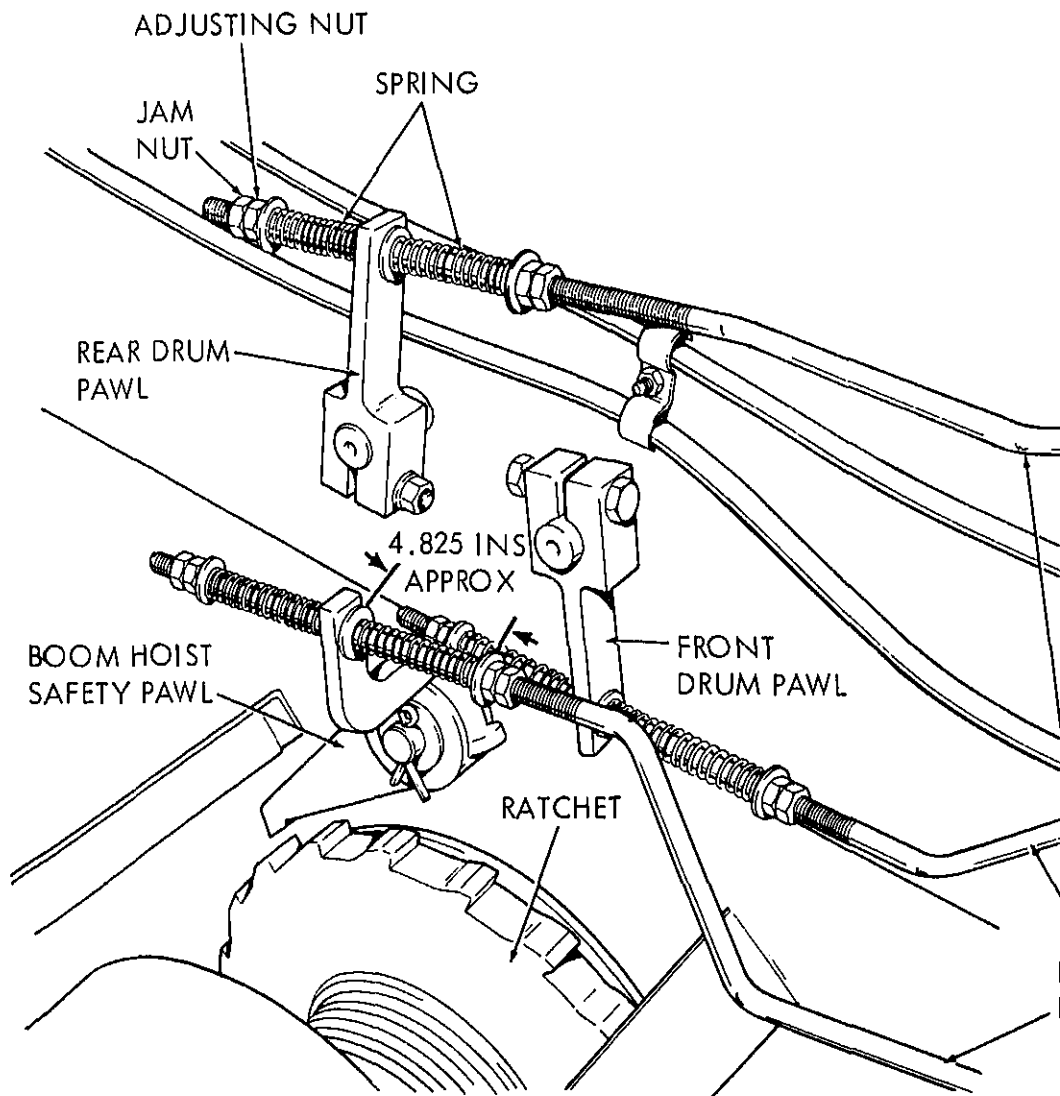
- STEP 1. REMOVE CAPSCREWS AND LOCKWASHERS (2 PER RO
REMOVE LOCKPLATE.
- STEP 2. PLACE WRENCH ON HEXAGONAL END OF ECCENTRIC
PIN AND TURN PIN IN EITHER DIRECTION UNTIL THERE
IS NO GAP BETWEEN ROLLER AND ROLLER PATH AT
POINT SHOWN.
- STEP 3. TURN ECCENTRIC PIN UNTIL THERE IS SOME GAP, BUT
LESS THAN 1/16 INCH, BETWEEN ROLLER AND ROLLER
PATH. MEASURE WITH FEELER GAGE.
- STEP 4. INSTALL CAPSCREWS, LOCKWASHERS, AND LOCKPLATE.

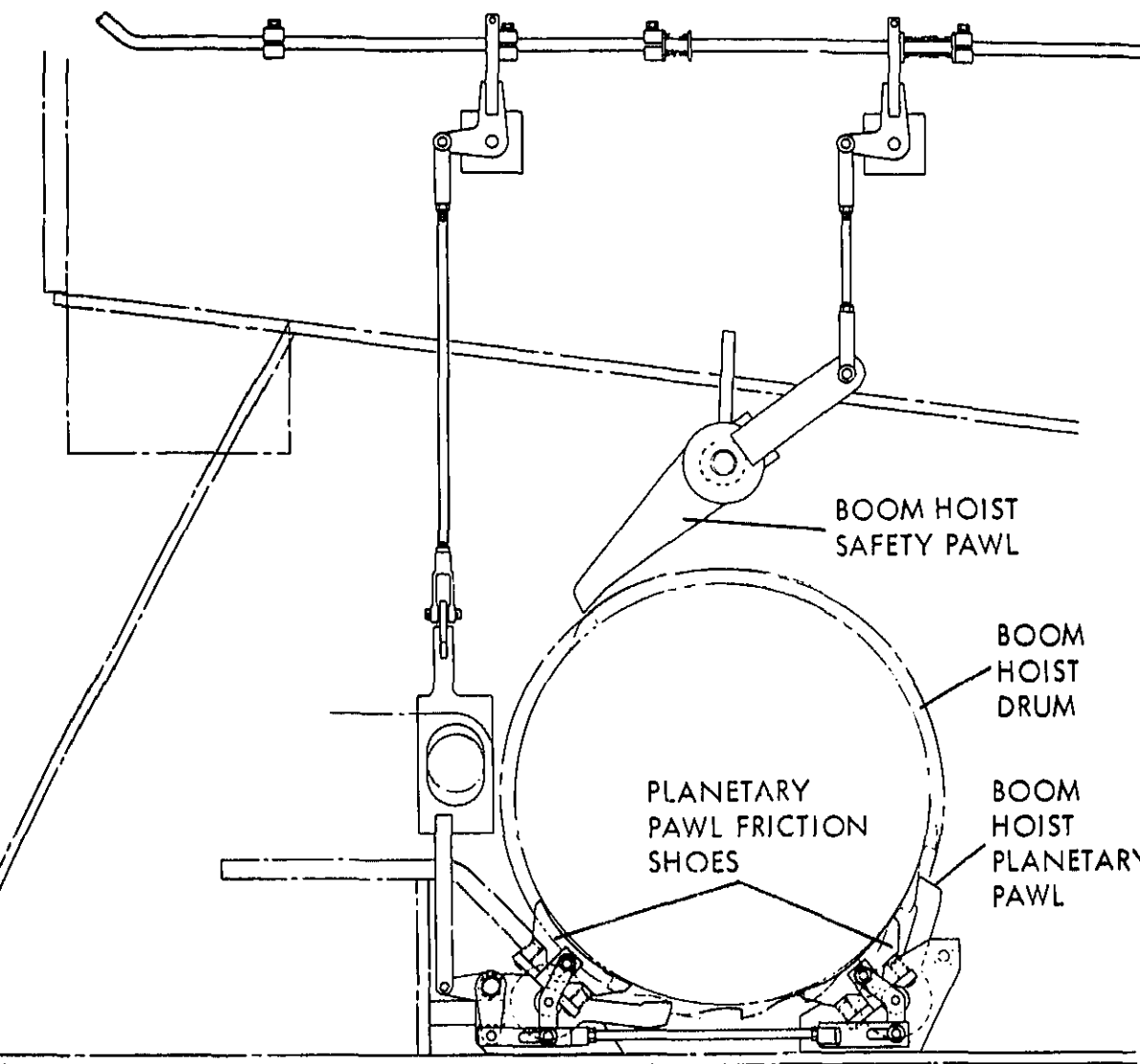


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Figure 4-67. Swing lock, replacement and adjustment.

- STEP 1. LOWER BOOM TO GROUND.
- STEP 2. PLACE PAWL LEVER IN ENGAGED POSITION AND SEE THAT PAWL ENGAGES RATCHET.
- STEP 3. PLACE PAWL LEVER IN DISENGAGED POSITION AND SEE THAT PAWL CLEARS RATCHET BY ABOUT 1/2 INCH.
- STEP 4. IF PAWL DOES NOT ENGAGE OR CLEAR RATCHET AS DESCRIBED ABOVE, LOOSEN JAM NUTS AND ADJUST ADJUSTING NUTS UNTIL THE SPRING LENGTH IS CORRECT TO ENGAGE AND DISENGAGE RATCHET PROPERLY.
- NOTE: THIS PROCEDURE APPLIES TO BOTH FRONT AND REAR DRUM PAWLS





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Figure 4-69. Hoist drum safety pawls.

concerning administrative coverage is 740-90-1.

ation for Storage

bly. Disassembly shall be limited to the

those items subject to pilferage. These items should be boxed.

b. Basic Issue Items. Basic issue items shall be isolated and packed with publications in the toolbox.

Section I. GENERAL

6-1. Scope

This part of the manual contains instructions for your use in operating, servicing and maintaining the carrier portion of the Harnischfeger truck crane

model M32ORT. Operator/crew personnel must read and understand the instructions in both parts of this manual prior to operating the machine.

Section II. DESCRIPTION AND DATA

6-2. Description

Refer to paragraph 1-7*b* for description of the model M32ORT carrier.

6-3. Tabulated Data

Refer to paragraph 1-8*b* for tabulated data, identification and instruction plate information.

Section I. OPERATING PROCEDURES

WARNING

If the carrier fails to operate after performing the service procedures contained in chapter 9, refer to the troubleshooting chart in chapter 8.

General

This section will provide sufficient information and procedures required to properly operate the M320RT carrier. Inspection and service procedures described in chapter 9 must be performed prior to attempting any operating procedures. It is important that the operator thoroughly familiarize himself with the location and function of each control instrument described in paragraph 7-2. Operating procedures as described in paragraphs 7-3 through 7-6 shall be understood prior to operation.

WARNING

Safety precautions listed on the inside front cover of this manual shall be understood and adhered to by all operating and crew personnel.

Controls and Instruments

General. The carrier controls are shown in figure sheets 1 and 2. A description of all controls and instruments are given in subparagraph 7-2b.

Carrier Controls and Instruments. The subparagraphs list and describe the M320RT carrier controls and instruments. The subparagraph numbers coincide with the index number on figure 7-1.

(1) *Vehicular light switch.* The vehicular light switch is located at the extreme left-hand side of the operators panel and is used to control the carrier's lights. The light switch assembly has three lever switches. These lever switches operate as follows:

(a) *Lock lever.* The lower right lever locks the steering lever from moving except to the blackout position. This lever thus prevents accidental actuation of the steering lever while operating under blackout conditions. To return the normal lighting, the lock lever must be moved to the "UP" position while moving the top lever

upward.

(c) *Panel light selector switch.* This switch is used to select the type of panel lighting. Four lighting positions are available, Park, Off, Dim, and Bright.

(2) *Turn indicator lights.* The two green turn indicator lights are located in the upper corners of the operator's panel, one on the left side and one on the right side. The light in the upper left corner will flash on and off when the directional turn lever is pushed downward, indicating the left turn signal light is operating. The light on the upper right corner will flash on and off when the directional turn lever is pushed upward, indicating the right turn signal light is operating.

(3) *Dash panel lights.* The four dash panel lights are located centrally on the panel, two on each side of the steering column. These four lights illuminate the dash panel for night operation.

(4) *Engine oil pressure warning light.* The engine oil pressure warning light is located on the upper portion of the operators panel, left of the steering column. This light will illuminate "Red" when the engine oil pressure drops below the operating minimum or when the oil pressure drops below 10 psi at low engine idle speed.

CAUTION

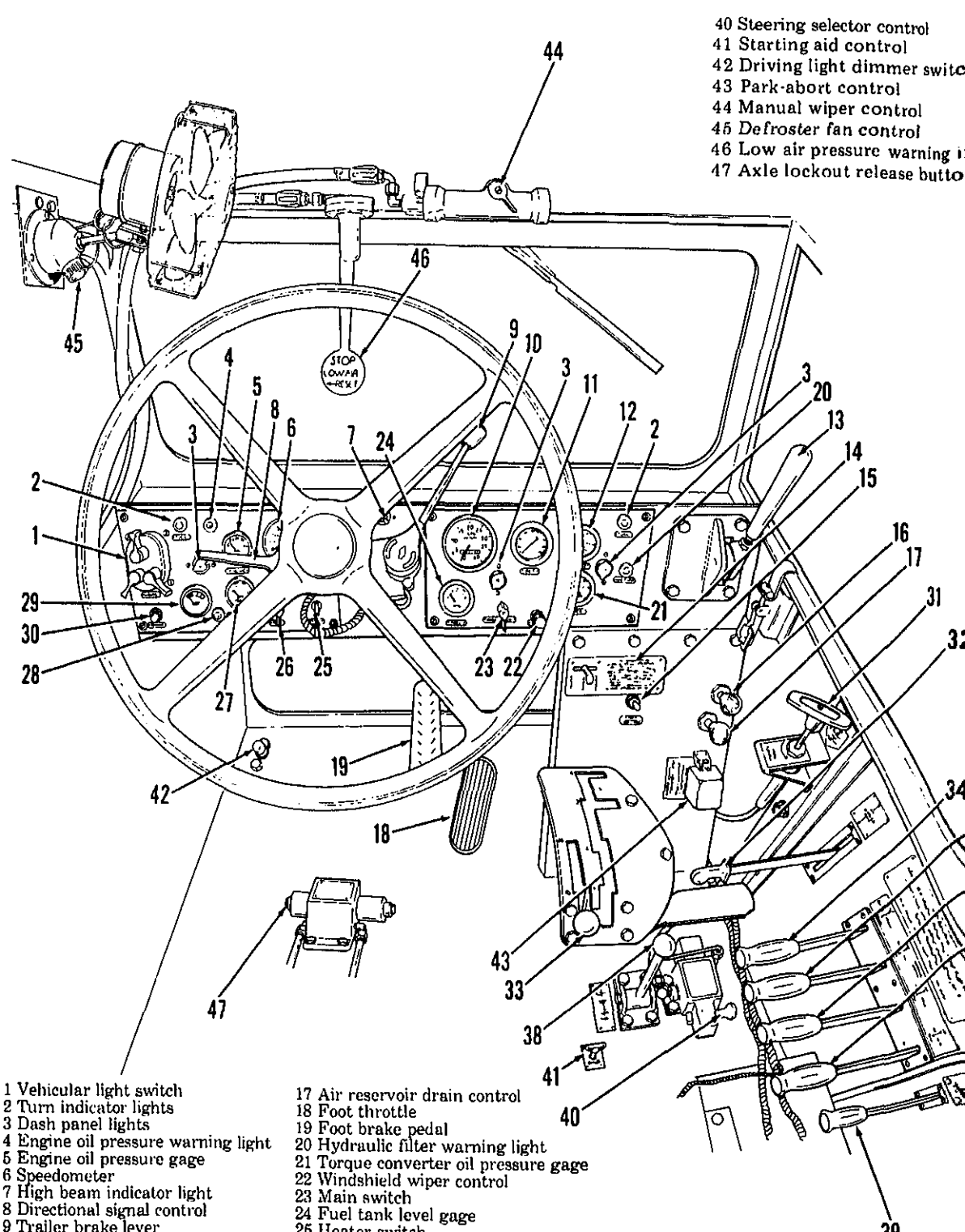
When the engine oil pressure warning light illuminates the carrier engine shall be shut down immediately.

(5) *Engine oil pressure gage.* The engine oil pressure gage is located left of the steering column in the upper position of the operators panel. This gage indicates the engine lubricating oil pressure. At normal operating speed and temperature the gage should read 30-45 pounds per square inch. As soon as the engine is started this gage should indicate 10 psi of pressure.

NOTE

When engine is cold, gage readings may be higher than when at operating temperature.

CAUTION



- 40 Steering selector control
- 41 Starting aid control
- 42 Driving light dimmer switch
- 43 Park-abort control
- 44 Manual wiper control
- 45 Defroster fan control
- 46 Low air pressure warning
- 47 Axle lockout release button

- 1 Vehicular light switch
- 2 Turn indicator lights
- 3 Dash panel lights
- 4 Engine oil pressure warning light
- 5 Engine oil pressure gage
- 6 Speedometer
- 7 High beam indicator light
- 8 Directional signal control
- 9 Trailer brake lever
- 17 Air reservoir drain control
- 18 Foot throttle
- 19 Foot brake pedal
- 20 Hydraulic filter warning light
- 21 Torque converter oil pressure gage
- 22 Windshield wiper control
- 23 Main switch
- 24 Fuel tank level gage
- 25 Heater switch

control actuates the turning lights. When placed in the downward position the lights on the left side of the carrier illuminate and when placed in the upward position the turning lights on the right side of the carrier illuminate.

(1) Trailer brake lever. The tractor brake lever is located on the right hand side of the steering column to the right of the steering wheel. This lever is used to connect air pressure to a towed trailer or vehicle. Pull the lever down to apply the brakes of the towed vehicle and push up to release.

(2) Tachometer-hourmeter. The tachometer-hourmeter is located to the right of the steering column on the upper portion of the operator's panel. The tachometer indicates the carrier engine speed in hundreds of revolutions per minute and records the accumulated engine operating time in hours.

(3) Air pressure gage. The air pressure gage is located to the right of the steering column on the upper portion of the operator's panel. This gage indicates the air pressure in the air brake system. It is graduated from 0 to 160 pounds per square inch and has a red line indicate 90 to 129 pounds under normal operating conditions.

(4) Torque converter temperature gage. The torque converter temperature gage is located to the right of the air pressure gage. The torque converter temperature is monitored by this gage, the normal operating temperature as indicated on this gage is 180°-200°F.

(5) Hand throttle. The hand throttle is located at the extreme right on the operator's panel. It is a push-pull type control used to maintain fixed speeds. Push the throttle lever upward to increase speed and pull downward to decrease engine speed to idler.

(6) Tractor protection brake control. The tractor protection brake control is located on the upper portion of the auxiliary panel. This three way lever is used to select the basic mode of operation of the air brake system. Place the lever in the extreme left (EMERGENCY) position for short term parking. Place the lever in the extreme right (PARK) position for long term parking.

(7) Front axle oscillate lockout (switch and system). The front axle lockout switch is located below the tractor protection control on the auxiliary panel. When the axle lockout system the vehicle is capable of operating on rubber tires.

The double acting cylinder mounted on the transmission shift gage tower actuates, locking out the transmission control.

NOTE

The main frame and axle housing must be kept parallel (within $\frac{5}{8}$ ") to properly engage both the cylinder locking devices to the front axle housing.

NOTE

The oscillate lockout can only be operated when the transmission shift control is in the neutral position.

To retract the axle oscillate lockout, hold the lockout switch in the "OFF" position until the transmission shift lock is released. The electric circuit of the lockout system is fused behind the operator's panel. In the event of an electrical failure occurs which cannot be corrected by replacing the fuse, the system can manually be retracted and the transmission shift lever released by depressing the recessed release button (47) in the two-way valve located behind the driver's seat.

WARNING

Heavy loads must not be lifted with this vehicle while operating on rubber tires. The axle oscillate lockout system is designed to handle light loads only, as very limited stability can be achieved without properly positioning the outriggers.

(16) Emergency - park brake control. The emergency — part brake control is located on the auxiliary operators panel to the right of the axle oscillate lockout switch. When parking or in case of emergency this control should be pushed which automatically sets the brakes.

(17) Air reservoir drain control. The air reservoir drain control is located below the emergency brake control on the auxiliary panel. This control is a push type control that when pushed, drains moisture from the air reservoir tanks.

(18) Foot throttle. The foot throttle is located on the cab floor and regulates the amount of fuel flow to the fuel injectors. Fuel flow increases as the pedal is depressed.

(19) Foot brake pedal. The foot brake pedal is located on the floor of the operator's cab. This pedal when depressed operates the metering air valve which regulates the flow of air to the wheel brakes.

operates the torque converter oil pressure.

WARNING

Failure of the torque converter oil pressure gage to indicate a reading is a danger signal. Immediately shut-down the engine and check for the cause.

(22) *Windshield wiper control.* The windshield wiper control is located to the left of the torque converter oil pressure gage. This control is a metering valve that turns the windshield wipers on and off. Rotating the control counterclockwise actuates the wipers and turning it clockwise stops them.

(23) *Main switch.* The main switch is located to the left of the windshield wiper control on the right operator's panel. This switch turns the electrical system on and off, including the fuel shut off.

(24) *Fuel tank level gage.* The fuel tank level gage is located right of the steering column or the lower portion of the operators panel. This gage indicates the amount of fuel in the fuel tank.

(25) *Heater switch.* The heater switch is located to the left of the steering column or the lower portion of the operators panel. It is a toggle switch used to turn the operator's cab heater on and off. Push the switch up to on and down to off.

(26) *Hazard warning switch.* The hazard warning switch is located on the directional signal control. Push the switch in to actuate all four turning lights. The signals will flash intermittently. Pull switch out to stop flashing of turning lights.

(27) *Engine temperature gage.* The engine temperature gage is located lower center of the operators panel left of the steering column. This calibrated needle-type gage indicate engine coolant temperature. The normal operating temperature is 165° to 175°F.

CAUTION

Coolant must not be allowed to boil away. If coolant starts to boil, immediately stop the engine and correct the cause. Do not add water (or anti-freeze solution) while engine is over-heated. Allow engine to cool prior to adding coolant to avoid engine damage.

(28) *Engine temperature warning light.* The engine temperature warning light is located to the left and below the engine temperature gage. This red light will illuminate when the engine coolant temp-

erature is too high. When the main switch is in the ON position this instrument indicates the condition of the batteries when the engine is running or stopped. It is also useful in diagnosing other problems. Refer to figure 2-2 for further information.

(30) *Starter-motor switch.* The starter-motor switch located on the extreme left corner of the operators panel is a push type switch used to actuate the engine starter-motor.

(31) *Utility blade lock control.* The utility blade lock control located to the right of the operator's panel is a push-pull type control. This control is used to release and engage the utility blade lock. Push the control down to release lock and lift up to engage the blade lock. In the down position the blade lock control can be locked in place by rotating the handle ¼ turn.

(32) *Utility blade control.* The utility blade control is located to the right of the operator's panel above the transmission gear range selector. It is a push type lever that is pulled up to raise the utility blade and pushed down to lower it.

(33) *Transmission gear range selector control.* The transmission gear range selector control is located to the right of the operators seat. The control is a push type lever is mounted in a slotted shifting control. It is used to select the desired direction of travel and gear ratio of carrier travel. Four forward speeds and two reverse speeds are provided. When operating in 3rd and 4th speed range, the torque converter can be locked up by pressing the selector to the right. This would be used in the road travel at speeds exceeding 20 mph.

(34) *Right-front outrigger control.* The right front outrigger control located to the right of the utility blade control raises the right-front outrigger when pulled up. When pushed down the right-front outrigger lowers.

NOTE

The hydraulic selector control (39) must be in the outrigger position to operate the four outrigger controls.

(35) *Right-rear outrigger control.* The right rear outrigger control is located to the right of the right front outrigger control. Pull control to raise the right-front outrigger and push control lever down to lower it.

outrigger. Pull the control lever up to raise left-rear outrigger and push control lever to lower it.

(38) *Front axle disconnect control.* The front disconnect control is located to the right of operator's seat. The floor mounted, rod-type is pulled backward to engage the front axle and pushed forward to disengage.

CAUTION

Do not engage the front axle drive when the vehicle is in motion.

(39) *Hydraulic selector control.* The three position hydraulic selector control is located at the extreme right rear corner of the operator's cab. The selector control will remain in the center (NEUTRAL) position during normal operation. Push selector lever down (FRONT AXLE OSCILLATE LOCKOUT) when desiring to utilize the front axle lockout system. Pull lever up (OUTRIGGER) position to operate the four outrigger con-

(40) *Steering selector control.* The steering selector control is located to the right of the front disconnect control. This control is used to select one of three steering methods. Place control in center for front wheel steering, forward position for four wheel steering and pulled backward for crab steering.

(41) *Starting aid control.* The quick-start controls are located on the operator's cab floor to the right of the seat. The control lever when pulled up draws a starting vapor into the air intake. Prior to operating the starting aid control refer to paragraph 7-4 for further instructions.

(42) *Driving light dimmer switch.* The driving light dimmer switch is located on the cab floor at the extreme left. The foot-operated switch controls the high beam driving lights.

(43) *Park-abort control.* The park-abort control is located on the auxiliary operator's panel with a protective cover. Push this control in to release the pressure in the brake system. Refer to paragraph 7-3 for additional information.

(44) *Manual wiper control.* The manual wiper control is located on the wiper motor at the top of the operator's cab. The wiper control lever is used to manually actuate the wiper blade in the event

drops to a low level the arm will drop and swing back and forth. Stop operations and allow pressure to rebuild to safe operating pressure.

(47) *Axle lockout manual release button.* The manual release button for front axle lockout is located in the two-way valve behind the operator's seat. In case of electrical circuit failure the lockout can be released by pushing this release button in.

(48) *Battery disconnect switch.* The battery disconnect switch is located at the rear of the operator's cab on the left side of the battery compartment. It is a three position switch that provides a positive disconnect for the electrical system. (Refer to fig. 7-2.)

7-3. Operation

a. *Preoperational Services.* Prior to starting and operating the M320RT carrier perform the following:

(1) Insure that the installation services as prescribed in 4-1 and 4-2 have been performed.

(2) Perform the preventive maintenance checks and services required in table 8-1.

b. *Starting the Carrier Engine.* Refer to paragraph 7-3 and start the carrier engine.

c. *Operating the Crane Carrier.*

(1) Start the carrier engine (para 7-3b) and allow brake air pressure to reach 120 psi.

(2) Insure positive release of park brake before moving as follows:

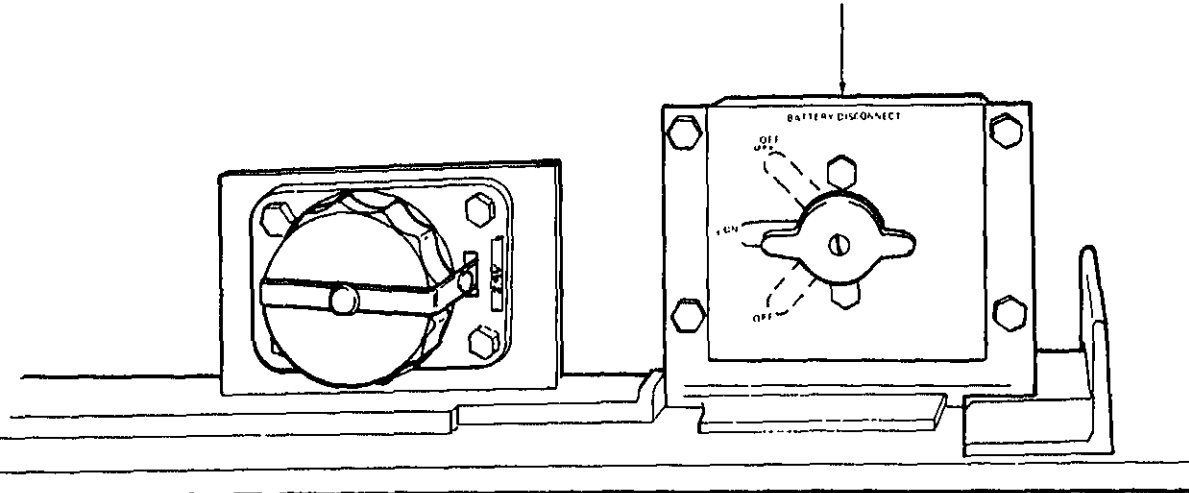
(a) Place emergency park brake control in fig. 7-1) in EMERGENCY position until pressure gage reads 120 psi.

(b) Move tractor protection control to RELEASE position.

(c) Apply the brake pedal for a 4-second interval and release. Allow air pressure to build back up to 120 psi.

NOTE

The air brake system is designed so that if the service air reservoir pressure drops below 40 psi, the brakes will be applied automatically. If the emergency pressure drops below 60 psi, the brakes will automatically be placed in the emergency — park situation. The same condition can be manually provided by actuating the



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Figure 7-2. Battery disconnect switch.

CAUTION

Equipment shall not be moved until the air pressure gage indicates sufficient air pressure (120 psi) to operate the brakes. Partial release of the emergency brake will generate heat and could cause tire and axle failure.

- (3) Check to insure the utility blade is locked in the up position. If the utility blade is down, pull the blade control lever (32, fig. 7-1) up, and lock it in place by pulling the blade lock control (31) and turning one-fourth turn in either direction.
- (4) Place the front axle disconnect control (38) in the two-wheel drive position by pushing the control lever forward.

NOTE

Four-wheel drive shall only be used when additional traction is required. For over the road, high speed driving, the carrier shall always be in two-wheel drive.

- (5) Place the transmission gear selector control (33) in first gear and depressing the foot throttle slowly to increase engine output, drive off. Shift the transmission through all four gear ratios.

NOTE

- (7) To park the carrier for a short period of time place the brake three-way control in the EMERGENCY position.

- (8) If carrier is to remain parked for a period of time, place the brake three-way control in the PARK position.

d. Stopping the Carrier Engine. When the carrier has been parked and brakes applied properly, the carrier engine shall be shut off as illustrated in figure 7-4.

- (1) Release pressure on the foot throttle hand throttle backward to the IDLE position. Allow engine to idle approximately 5 minutes before shutting it off.

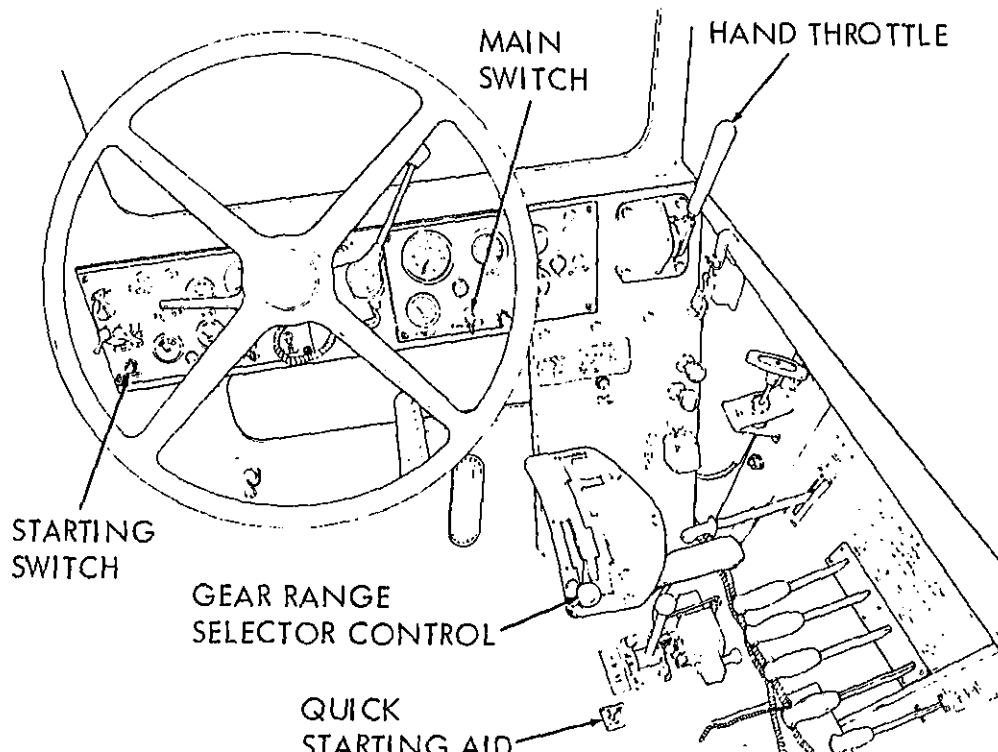
- (2) Place the main switch (fig. 7-1) to the OFF position.

- (3) Place battery disconnect switch (fig. 7-2) to the OFF position.

e. Operating the Crane Carrier Over Rough Terrain.

- (1) Start the carrier engine (para 7-3b).
- (2) Insure the utility blade is locked in the travel position (para 7-3c(3)).
- (3) Axle lock out in the off position.
- (4) Insure the parking brake is released (7-3c(2)).

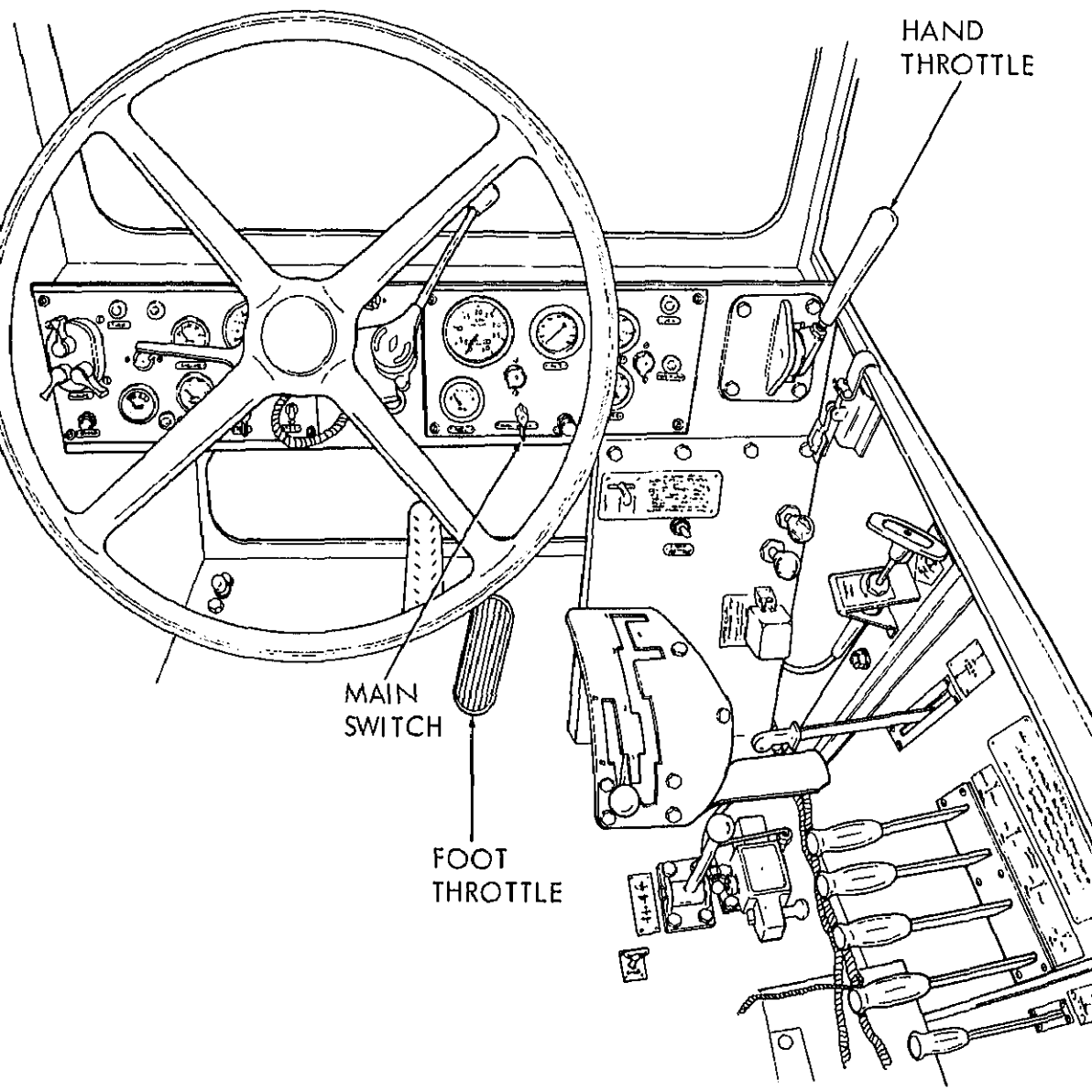
- HAND THROTTLE AND ENGINE: THE HAND PRIMER IS LOCATED AT THE REAR LEFT SIDE OF THE ENGINE.
- NOTE: IN AMBIENT TEMPERATURE BELOW 40°F IT MAY BE NECESSARY TO USE THE STARTING AID. REFER TO PARAGRAPH 7-4 FOR INSTRUCTIONS.
1. TURN BATTERY DISCONNECT SWITCH (FIG. 7-2) TO "ON".
 2. TURN ALL ELECTRICAL SWITCHES AND LIGHT SWITCHES TO THE "OFF" POSITION.
 3. PLACE GEAR RANGE SELECTOR CONTROL IN THE "NEUTRAL" POSITION.
 4. TURN MAIN SWITCH TO THE "ON" POSITION.
 5. PUSH HAND THROTTLE FORWARD TO MID POSITION.
 6. PRESS STARTER SWITCH.
- CAUTION: DO NOT OPERATE THE CRANKING MOTOR MORE THAN 30 SECONDS CONTINUOUSLY WITHOUT ALLOWING A 2 MINUTE COOLING PERIOD. IF ENGINE DOES NOT START AFTER SEVERAL TRIES, STOP CRANKING. DETERMINE CAUSE AND CORRECT OR REPORT CONDITION TO ORGANIZATIONAL MAINTENANCE.
7. PULL HAND THROTTLE BACK TO FAST IDLE SPEED (1500 RPM) UNTIL TEMPERATURE GAUGE REACHES NORMAL.
 8. CHECK FOR WARNING LIGHTS OR ABNORMAL GAUGE INDICATIONS. LISTEN FOR ANY ABNORMAL NOISES.

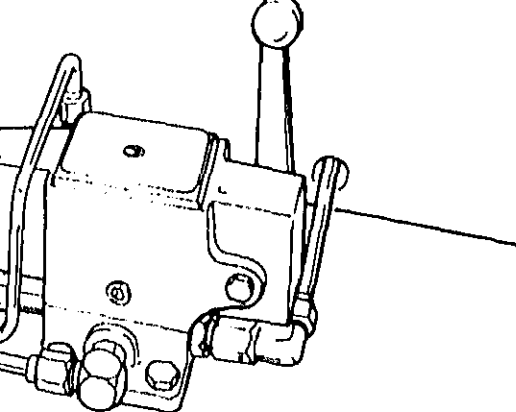


BACKWARD TO THE "IDLE" POSITION.
NOTE: ALLOW ENGINE TO IDLE APPROXIMATELY 5 MINUTES BEFORE SHUTTING
ENGINE OFF.

STEP 2. PLACE THE MAIN SWITCH TO THE "OFF" POSITION.

STEP 3. PLACE BATTERY DISCONNECT TO THE "OFF" POSITION (SEE FIG. 7-2).





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Figure 7-5. Steering selector control.

are automatically centered (fig. 7-8).

NOTE

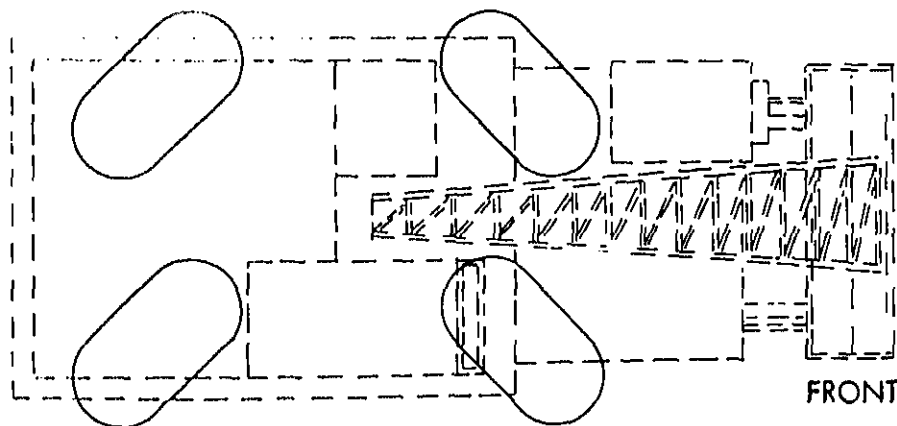
A manual lock is provided for the rear axle and should always be installed for over-the-road travel (see fig. 7-9).

(6) When operating over rough terrain it may be necessary or desirable to place the vehicle in four-wheel drive. To engage the front wheel drive, stop the crane carrier and pull the front axle drive control (38, fig. 7-1) backwards, to engage the front axle drive.

CAUTION

Do not place carrier in four-wheel drive while vehicle is moving.

(7) Place the transmission gear range selector control (33) in 1st gear and depress the foot throttle slowly.



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Figure 7-6. Four-wheel steering.

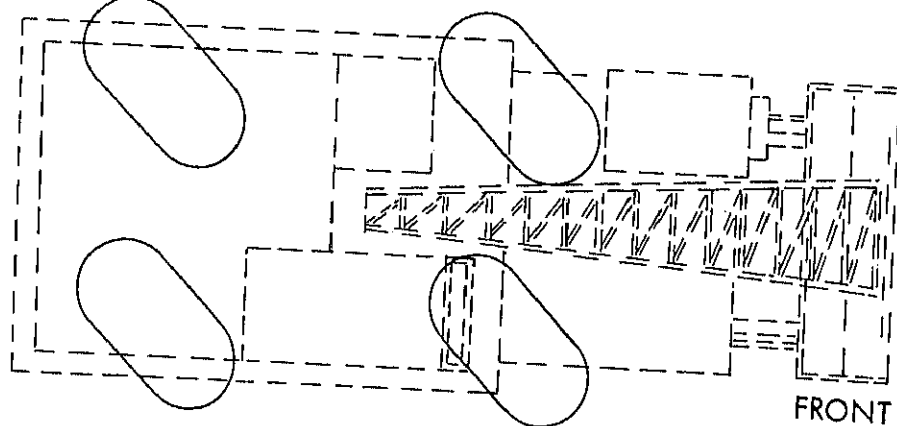


Figure 7-7. Crab steering.

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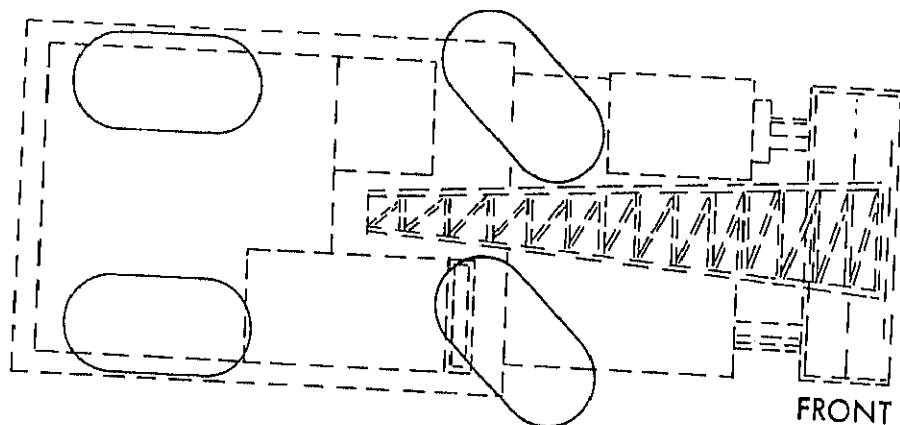


Figure 7-8. Front wheel steering.

(TA033050

CAUTION

When shifting the transmission gear range selector control always shift one range at a time without skipping a gear ratio.

(8) To slow, stop and park the carrier refer to paragraph 7-3C.

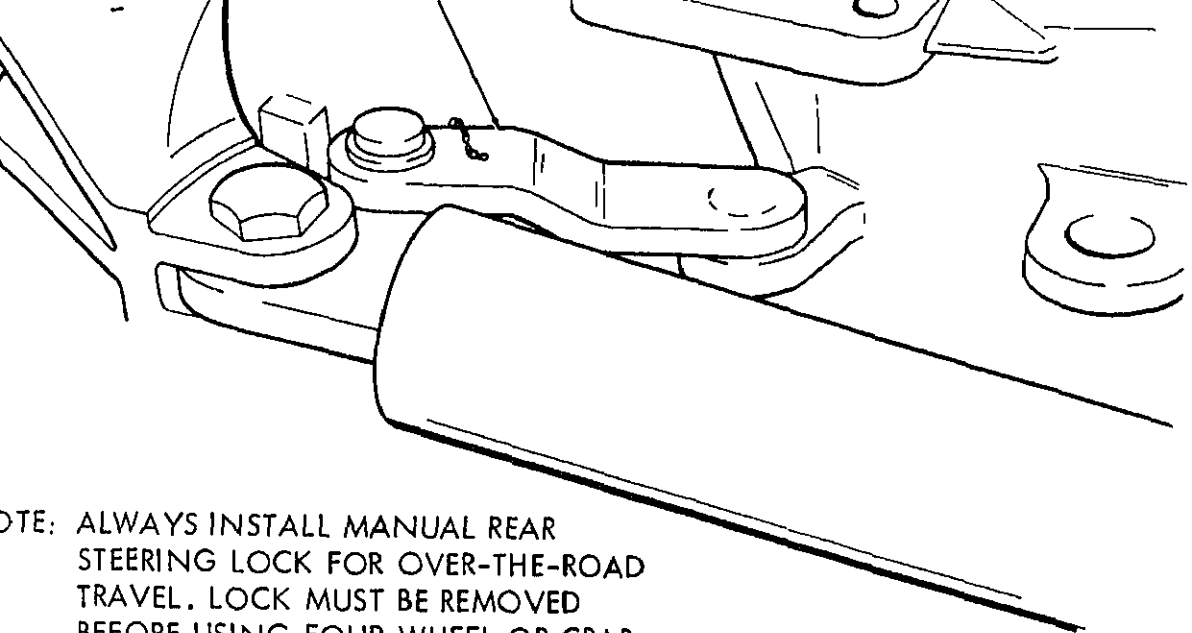
(1) When towing the M320RT carrier, a vehicle with an air brake system capable of producing psi air in the system should be used.

CAUTION

Boom must be 8" above bottom of bo cradle.

(3) If towing speeds are expected to 5-miles-per-hour, or if carrier is to be towed than one-fourth of a mile, the propeller from the front and rear axles must be connected, (see fig. 7-10).

(4) Install the rear axle steering lock



NOTE: ALWAYS INSTALL MANUAL REAR STEERING LOCK FOR OVER-THE-ROAD TRAVEL. LOCK MUST BE REMOVED BEFORE USING FOUR-WHEEL OR CRAB STEERING.

(TA0330)

Figure 7-9. Rear axle steering lock.

NOTE

It must be taken that the jumper air lines are connected properly. Carrier "EMERGENCY" to mover "EMERGENCY" and carrier "SERVICE" to mover "SERVICE".

Place the emergency-park brake control in the "EMERGENCY" position. Insure the positive operation of park brakes as described in paragraph 7-3C(2).

Vehicle is now ready to be towed as required.

Install the utility blade brace as illustrated in figure 7-11.

Connect chains or wire rope slings to the eyes of the dozer blade (fig. 7-12).

With the carrier engine operating, release the park brakes as described in paragraph 7-3C(2).

If the carrier engine cannot be started, disconnect the air hoses to the carrier and release the park brakes as described in paragraph 7-3C(2).

hydraulic oil to by-pass and the utility blade float.

CAUTION

Do not attempt to retrieve the carrier without the park brakes being released.

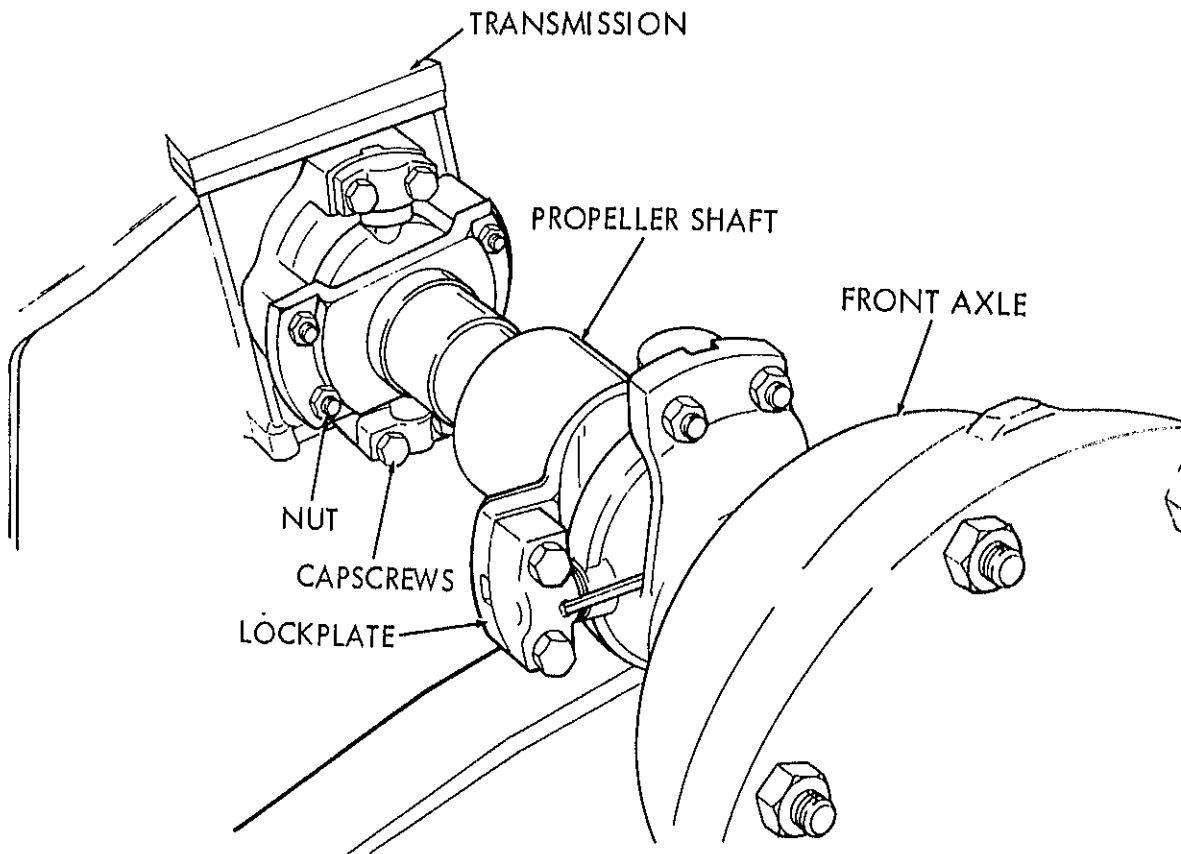
(6) In case the carrier brake system is inoperative and all methods have been tried to release the brakes without success, an emergency method is available. Refer to figure 7-13 and release the brakes as illustrated.

h. Utility Blade Operation. The utility blade provides a means to level the ground area where the M320RT crane is to be used. The following subparagraphs describe the operation of the utility blade.

(1) The carrier engine must be adjusted to fast idle for proper operation (approx. 1,000 rpm).

(2) To release the blade lock, pull the utility blade control lever (32, fig. 7-1) up and raise the blade slightly. With blade pressure removed, lock push the blade lock control (31) down.

(3) Remove utility blade brace as illustrated.



- STEP 1. REMOVE CAPSCREWS, NUTS AND LOCKWASHERS FROM BOTH TRANSMISSION AND FRONT AXLE ENDS.
- STEP 2. REMOVE PROPELLER SHAFT FROM VEHICLE.
- STEP 3. REMOVE REAR AXLE PROPELLER SHAFT IN SAME MANNER.

(TA03)

Figure 7-10. Propeller shaft, disconnection.

(4) Lower the utility blade by pushing the control lever (32) down. Raise blade by pushing the control lever up.

(5) Upon completion of utility blade always lift up and engage the blade lock by pulling the lock control (31) up and turning the handle one-fourth turn in either direction.

Outrigger Floats. The M320RT crane is equipped with four hydraulically controlled outriggers used for carrier stability during operation.

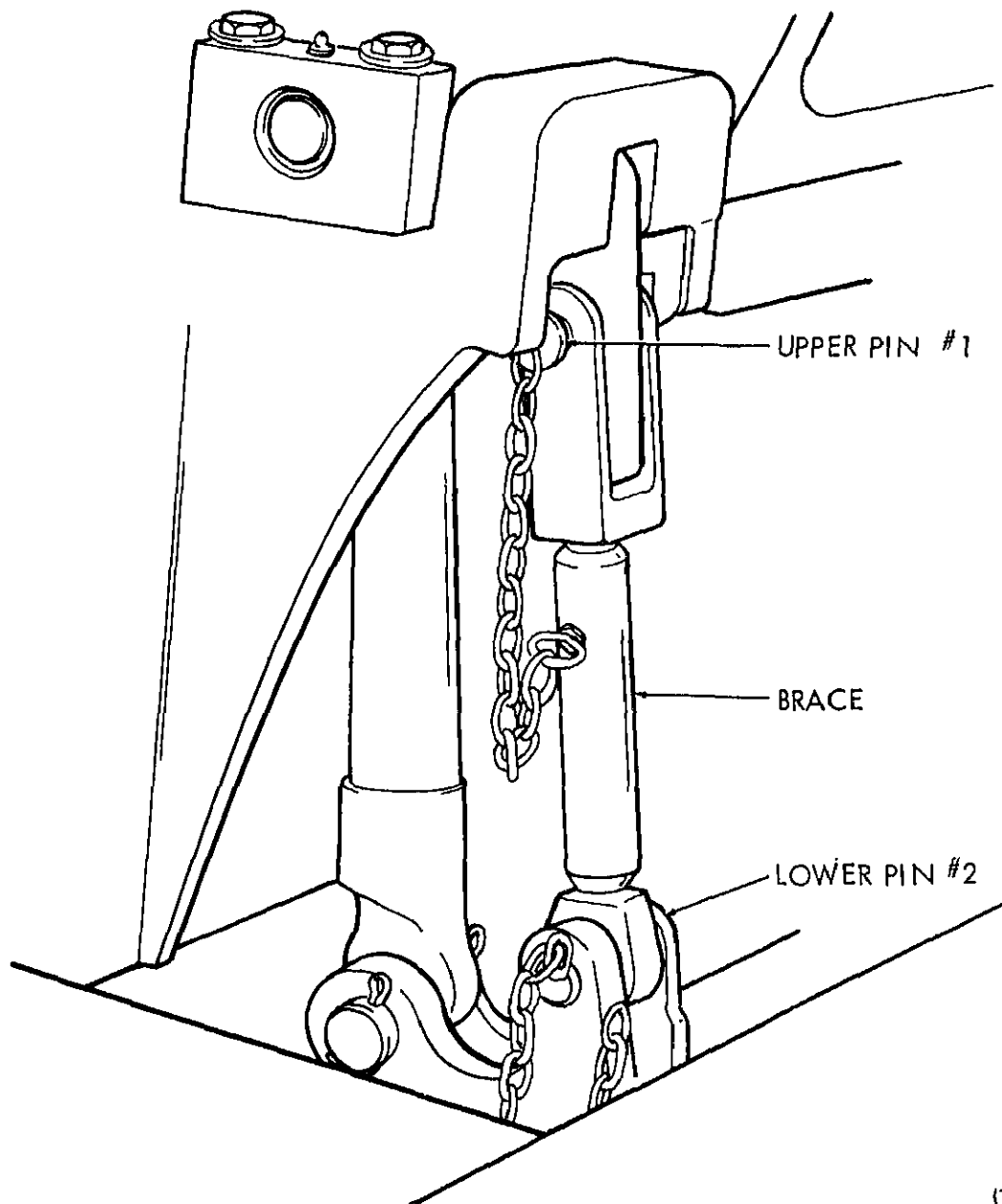
(2) Install the outrigger floats on the cylinder as illustrated on figure 7-15.

(3) Pull hydraulic selector control (29, figure 7-14) up to the outrigger operating position.

(4) Position individual outriggers as required by operating their respective controls (34, 35, 36, and 37). Pull levers up to raise outriggers and push down to lower.

j. *Axle Oscillate Lockout* Operation

STEP 3: INSTALL BRACE INTO LOWER BRACKET.
 STEP 4: INSTALL PIN (LOWER) #2.
 NOTE: MOVE UTILITY BLADE UP OR DOWN AS
 REQUIRED TO INSTALL BRACE AND PIN.



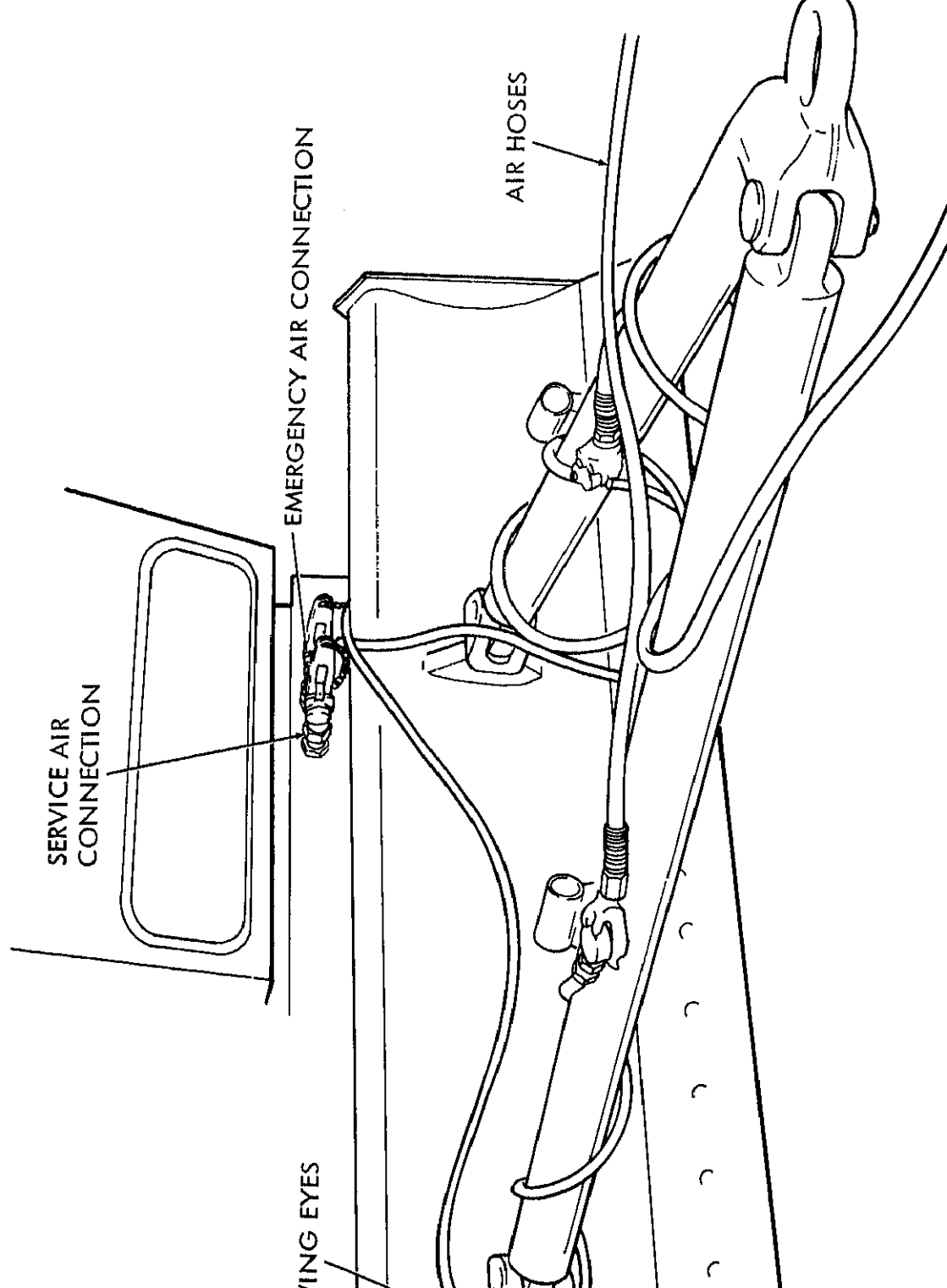
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Figure 7-11. Utility blade brace installation.

(3) in NEUTRAL position.

NOTE

(3) Place front axle oscillate lockout switch (1) in the IN position and hold until transmission s



SERVICE AIR
CONNECTION

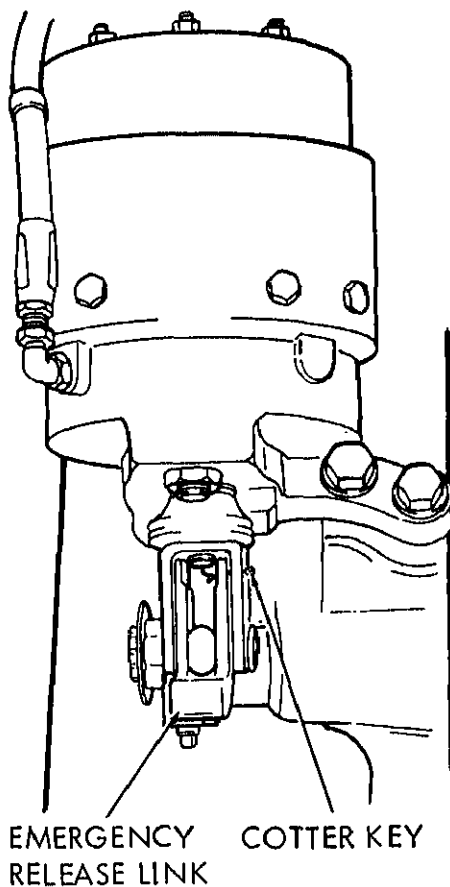
EMERGENCY AIR CONNECTION

AIR HOSES

ING EYES

EMERGENCY BRAKE RELEASE PROCEDURE

- STEP 1. REMOVE COTTER KEY HOLDING
RELEASE LINK IN PLACE.
- STEP 2. STRIKE ANVIL OF RELEASE LINK
TO DISPLACE LINK.
- STEP 3. REPEAT STEPS 1 AND 2 ON RE-
MAINING BRAKE CHAMBERS.



- STEP 1. REMOVE BOLT FROM CARRIER STEP.
STEP 2. SWING STEP BACK TO CLEAR FLOAT.
STEP 3. REMOVE OUTRIGGER FLOAT.
STEP 4. REMOVE OPPOSITE FRONT FLOAT IN SAME MANNER.

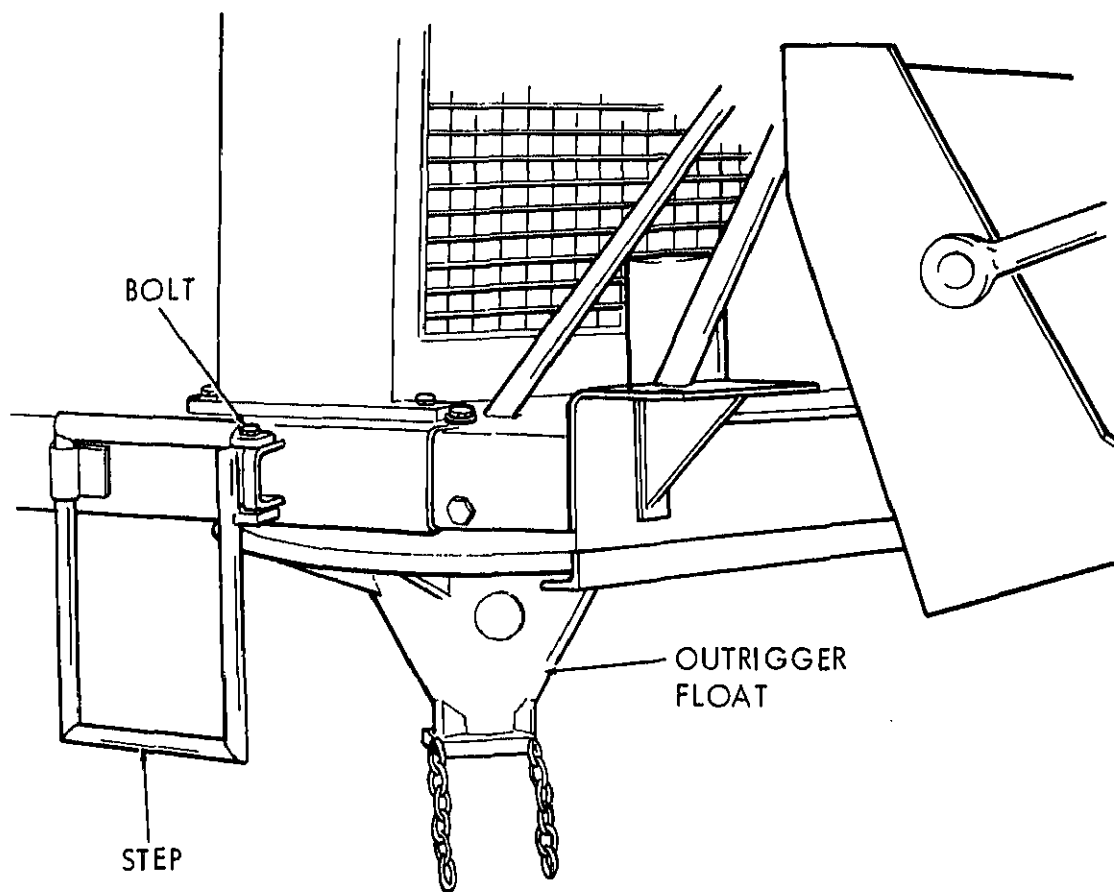


Figure 7-14. Stowed outrigger floats, removal and installation (sheet 1 of 2).

STEP 2. SWING LOCK BAR OUT TO CLEAR OUTRIGGER FLOATS.
STEP 3. SLIDE OUTRIGGER FLOATS OUT FROM STOWED POSITION.

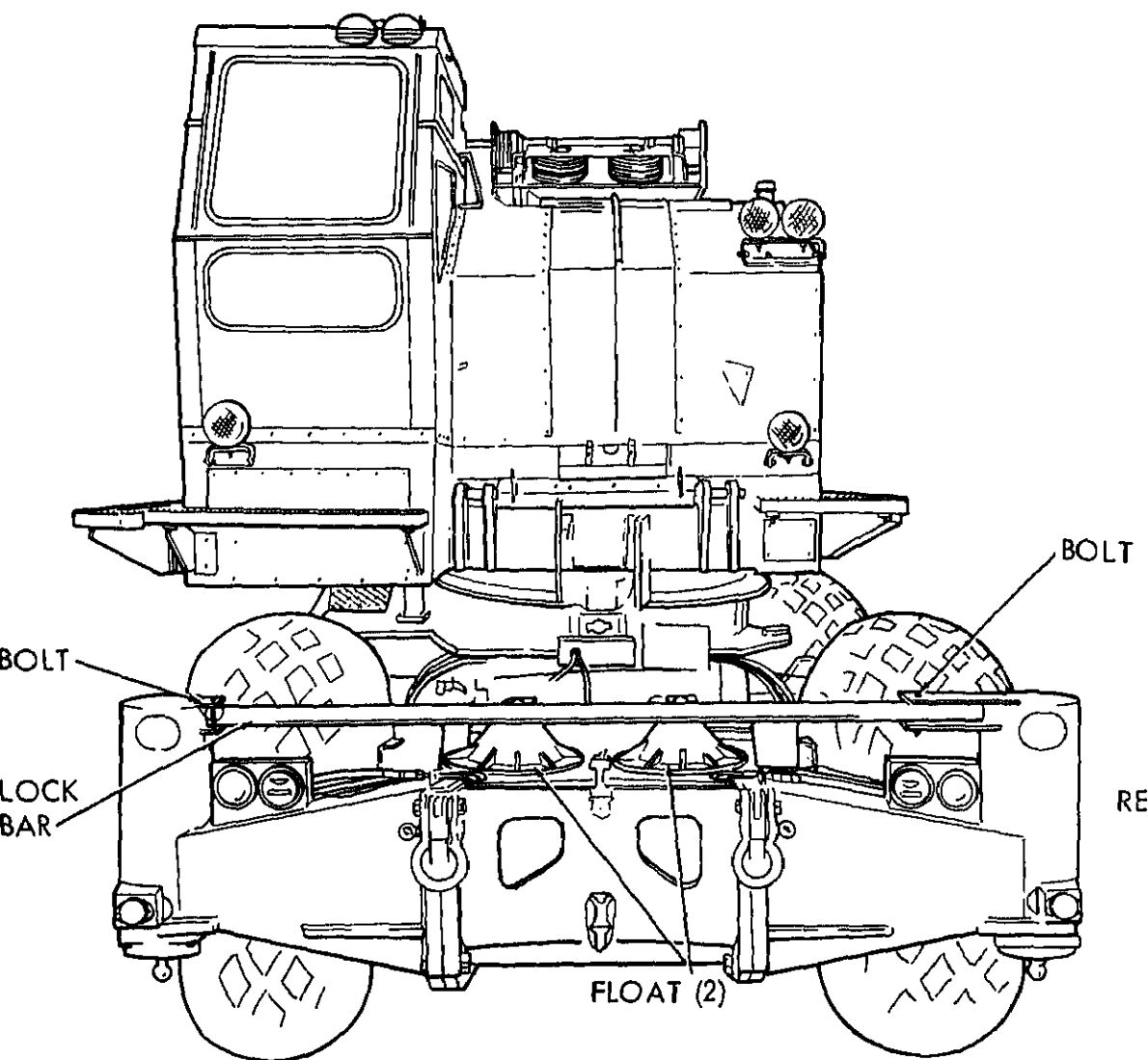


Figure 7-14. Stowed outrigger floats, removal and installation (sheet 2 of 2).

- STEP 1. POSITION FLOATS ON
OUTRIGGER CYLINDERS.
- STEP 2. SECURE WITH LOCK PIN.
- NOTE: LOWER OUTRIGGERS ONLY
ENOUGH TO STABILIZE
THE VEHICLE. DO NOT LIFT
WHEELS OFF THE GROUND.

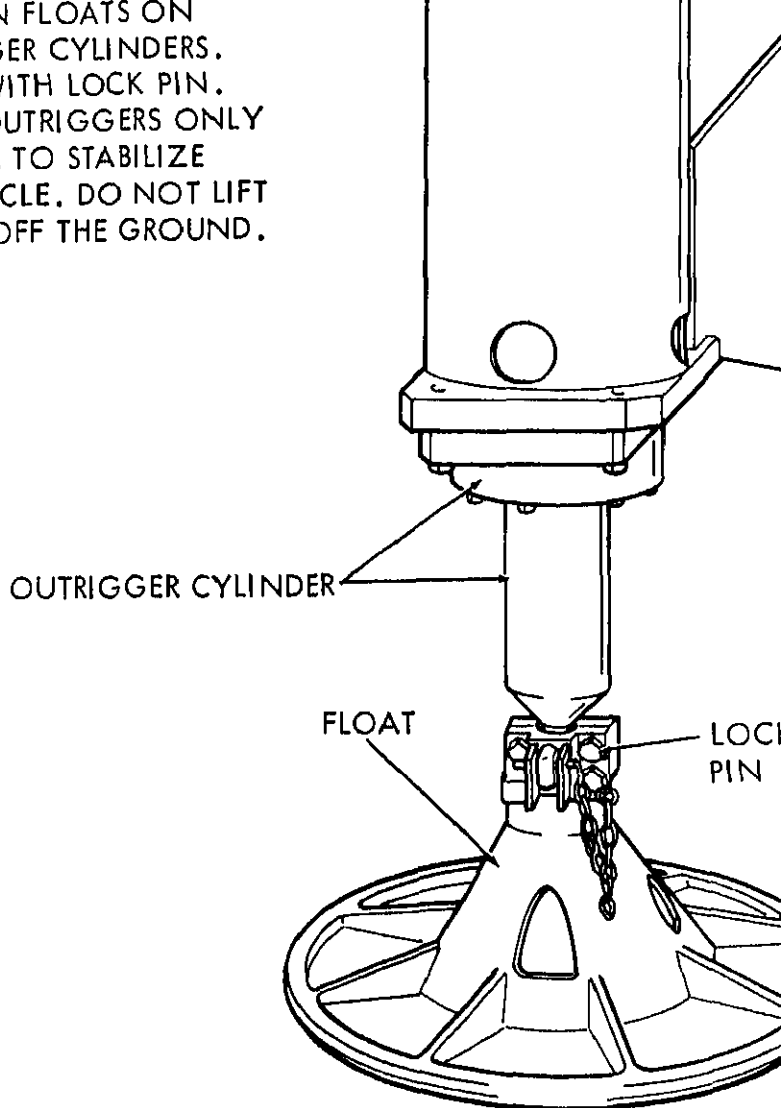


Figure 7-15 Outriggers floats, installation.

Section II. OPERATION OF AUXILIARY EQUIPMENT

7-4. Quick Start System

a. Description. The quick-start control is located on the right side of the operator in the operator's cab. (See fig. 7-1.) This control dispenses starter fluid, into the manifold when pushed down.

CAUTION

When using the starting aid care must be

to 15 cc per second depending on temperature.

b. Operation. Pull starting aid (fig. 7-1) up for ½ second (In colder temperatures pull starting aid control up for approximately 1 second). Push starting aid control down, wait 2 seconds and pull starting aid control up as described in figure 7-2. It may be

Operators Cab Heater

Description. The operators cab heater is mounted beside the operator's seat. It is a circulating hot water type controlled by heater switch (25) on the operator's panel.

Operation. Open the water shut-off cock on engine allowing the hot coolant to circulate through cab heater coils. Place heater switch (25) in energizing the heater fan and circulating warm air into the cab.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

Operation in Extreme Cold

General. When operating the carrier in extremely cold temperature, it is necessary to take special precautions. In below freezing temperatures metal and rubber parts become brittle and may crack or break if carrier is jarred or operated in a jerky manner. The carrier should be warmed slowly prior to starting any operations. Always start all operations of the carrier in low temperature range.

WARNING

Special care must be taken in cold temperatures to avoid spilling fuel, coolants or other liquids on themselves to prevent frost bite. Extreme care should also be taken to avoid contacting skin to cold metal as frost bite can result.

Lubrication.

(1) Refer to the current lubrication order for information on special lubricants to use in cold weather.

(2) Check oil level and condition frequently as cold weather will increase consumption, contamination and sludge formation. Refer to paragraph 7-3 for instructions if the oil and filter requires changing.

Coolant System.

(1) Insure proper circulation of coolant by bleeding and flushing the cooling system with clean water.

(2) Inspect the entire system for leaks. Tighten all hose clamps and replace worn or damaged hose connections.

(3) Fill the cooling system with the proper mixture of antifreeze. Refer to TP 350 651

7-8. Fire Extinguisher

a. Description. The dry chemical type fire extinguisher is suitable for use on all type of fires except a 2½-pound, stored-pressure, lever-operated extinguisher.

b. Operation. Remove extinguisher from its location, lift the handle, press lever, and direct powder at the base of the flame in a side-to-side sweeping motion.

CAUTION

When adding water in subzero temperatures the battery must be charged immediately, either externally or with the engine running for a minimum of 15 minutes.

(2) Keep battery terminal connections clean and free from ice and snow. Ice and snow on connections may cause an external short and overcharge the batteries.

(3) In extremely cold temperatures, remove the batteries and place them in a heated space when not in use. A warm battery will produce higher current output than a cold battery.

e. Fuel System. To minimize condensation the fuel tank should be kept as full as possible at all times. If the presence of water is noted in the fuel tank, drain and refill the fuel tank. Refer to paragraph 9-29.

f. Starting Carrier Engine.

(1) Prior to attempting to start engine in extremely cold temperatures, prime engine with starting aid as directed in paragraph 7-4.

(2) Start carrier engine as described in paragraph 7-3.

CAUTION

Check all instruments for dangerous conditions or abnormal conditions when the carrier engine starts. If any dangerous indications exist, stop engine immediately and search for deficiencies, and report the results to organizational maintenance.

7-8. Operation in Extreme Heat

(1) To insure proper circulation of the coolant through the radiator core, drain and flush the cooling system with clean water.

(2) Clean the radiator cooling fins of insects, leaves, dirt, and other foreign materials that may restrict air flow.

(3) Inspect the cooling system for leaks. Replace worn or damaged hose connection. Tighten hose clamp.

(4) Inspect coolant fan for proper operation. Report any defects to organizational maintenance.

(5) If the engine overheats after refilling the coolant system, shut down the engine and allow it to cool. Drain and flush the entire coolant system and refill with clean water; do not use salt or mineral water solutions.

(6) If the engine continues to overheat, report condition to organizational maintenance.

d. Batteries.

(1) Check electrolyte at frequent intervals and add distilled water as necessary to maintain an electrolyte level three-eighths of an inch above plates.

(2) Open battery box to allow air to circulate around batteries to decrease the possibility of battery overheating.

7-9. Operation Under Dusty or Sandy Conditions

a. General. Abrasive action of fine sand and dust presents special problems when operating in dusty or sandy areas.

b. Lubrication. Lubricants and lubricating equipment must be kept free of dust and sand.

(1) Service air cleaner and breathers at frequent intervals to remove sand and dust.

(2) Lubricate more frequently as fine sand or

lacking the grease gun.

c. Fuel System. Keep the fuel tank filter tight to prevent sand or dust from entering fuel tank. Fuel filters must be serviced at frequent intervals to keep them free of dust and sand.

7-10. Operation in High Humidity and Salt Water Areas

a. General. When operating in high humidity and salt water areas special precautions should be taken to prevent rusting of metal parts and deterioration of paint and electrical wiring.

b. Wiring. Although the wiring has been specially treated to resist fungus and rot, inspect frequently for deterioration and worn spots. Report any defects to organizational maintenance.

c. Rust and Corrosion.

(1) Remove rust from surface as soon as noted and paint bare surface.

(2) Remove any corrosion and place a thin film of lubricant on all polished and machined metal surfaces.

7-11. Operation at High Altitudes

a. General. Due to lower atmospheric pressure and wide temperature ranges operating at high altitudes present special problems.

CAUTION

Check the engine frequently for overheating in high altitude operation.

b. At altitudes above 5,000 feet the engine may not get the proper fuel/air mixture. If the engine runs rough, refer the equipment to organizational maintenance for proper fuel injector replacement.

c. Frequently check and service the air cleaner.

Section I. LUBRICATION INSTRUCTIONS

General

This section contains lubrication instructions that in addition to the instructions contained in lubrication orders LO5-3810-295-12-1, -2, and -3.

8-2. Lubrication

Refer to paragraph 3-2 for general lubrication instructions.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

General

Insure that the model M320RT carrier is ready for operation at all times it must be consistently systematically inspected for defects and damage. Performing checks listed in table 8-1 will enable defects and damage to be discovered and corrected before they result in serious failures. Minor defects discovered during operation should be corrected for correction at the earliest opportunity. Stop operation immediately if a problem exists which could cause damage to carrier if operation is continued. All defects and corrective action

taken shall be recorded on DA Form 2404 as possible.

8-4. Preventive Maintenance Checks and Services

See tables 8-1 and 8-2 for a list of preventive maintenance checks and services. The list is designed so that if each item is checked in a number order one or more persons can perform checks in a minimum amount of time. Table 8-1 to be used for operational checks and table 8-2 for weekly checks.

Table 8-1. Operator Crew Preventive Maintenance Checks and Services

B — Before Operation
Time required:

D — During Operation

A — After Operation
Time required:

| Interval and Sequence No. | | | Item to be inspected Procedure |
|---------------------------|---|---|---|
| B | D | A | |
| | | | NOTE Visually inspect for evidence of lubricant and fuel leaks concurrently with the daily service checks. |
| 1 | 1 | 1 | FUEL SUPPLY Refill fuel tank as required. |
| 2 | | | ENGINE OIL LEVEL. Check engine dipstick for correct oil level. Add oil as necessary. If oil looks excessively dirty, change oil and filter. Refer to LO5-3810-295-12. |
| 3 | | | AIR CLEANER Check oil level and add oil as required. Refer to LO5-3810-295-12. |
| 4 | | | HYDRAULIC OIL RESERVOIR Check oil level and refill as necessary. |
| 5 | | | BATTERIES Check electrolyte level. Add distilled water to 3/4 inch above plates as required. |
| 6 | | | TIRES AND WHEELS Check tire pressure. Correct pressure is 55 psi. Add or release air as required. Inspect for cuts, breaks or imbedded foreign matter. |
| 7 | | | FIRE EXTINGUISHER Inspect for broken seal. |

| Interval and Sequence No. | | | Item to be inspected Procedure |
|---------------------------|---|---|--|
| B | D | A | |
| 10 | 1 | 4 | WINDSHIELD WIPER Inspect wiper blade and arm for damage. Replace as necessary. |
| | 2 | | BRAKES Inspect for proper operation. Check air system for leaks and damage. |
| | 3 | | ALTERNATOR Check ammeter to insure alternator is charging batteries. |
| | 4 | | GAGES AND INSTRUMENTS With the carrier running, check all gauges for normal readings as detailed in paragraph 7-2. |
| | | | NOTE During operation continue to observe gages. Be alert to any unusual noises, vibrations or faulty operating condition. |

Table 8-2. Operator Crew Preventive Maintenance Checks and Services

D / Daily

Time required: 0.0

W — Weekly

Time required: 1

| Interval and Sequence No. | | | Item to be inspected Procedure |
|---------------------------|---|----|--|
| | D | W | |
| | | 1 | Lubricate in accordance with the lubrication chart. DRIVE BELTS Inspect belt deflection as described in paragraph 8-12. |
| | | 2 | BATTERIES Tighten loose cables and mounting corrosion. Inspect for crack and leaks. Clean filler cap holes. Add water to three-eighths of an inch above plates as required. In freezing temperatures operate engine a minimum of 1 hour. |
| | | 3 | FUEL FILTERS Drain water and sediment from filter. Inspect for leaks. Replace filter if excessively dirty or after 250 hours of operation. |
| | | 4 | TIRES AND WHEELS Inspect for excessive wear, cut, breaks, imbedded foreign matter and missing valve caps. Replace as necessary. |
| | | 5 | CRANKCASE OIL. Check crankcase oil level. Add oil if required. See L05-3810-295-12 for proper lubricant. Change oil if excessively dirty. |
| | | 6 | HYDRAULIC RESERVOIR Check level and add oil as required. See L05-3810-295-12. |
| | | 7 | AIR RESERVOIR Drain air pressure and drain water and sedimentation. |
| | | 8 | CARRIER Run carrier and check operation of all gages and controls on described in table 8-1. |
| | | 9 | OIL COOLER Check oil cooler for oil leaks or other physical damage. Report leaks and/or damage to Direct Support Maintenance. |
| | | 10 | OIL PUMP Inspect oil pump for leaks or damage. Report condition to direct support maintenance. |

Section III. TROUBLESHOOTING

General

This section provides a guide to be used by the

8-6. Operator/Crew Maintenance Troubleshooting

ENGINE WILL NOT CRANK.

- Step 1. Check master and battery disconnect switch for the *ON* position.
Turn switches *ON*.
- Step 2. Check for discharged batteries and low electrolyte level.
Have organizational maintenance charge or replace discharged or damaged batteries.
- Step 3. Check battery cables, terminals and ignition wiring for breaks, loose connections, corrosion.
Clean battery terminals and cables of corrosion.
Replace damaged cables. Replace or splice broken ignition wiring.
- Step 4. Check to see if starter is engaging engine flywheel when starter button is depressed. A spinning or clicking sound at the starter indicates a faulty starter, a loose wire.
Have organizational maintenance repair starter.

ENGINE CRANKS, BUT TOO SLOW TO START.

- Step 1. If engine has not been started within a few days the fuel lines may be empty.
Hand prime engine with priming pumps provided.
- Step 2. Check fuel tank level.
Refill fuel tank.
- Step 3. Check air cleaner and air intake lines for damage.
Clean lines and service air cleaner as described in paragraph 9-32.
- Step 4. Check level filter and lines for dirt, obstructions and damage.
Clean lines as required. Service fuel filter as described in paragraph 9-32.
- Step 5. If engine still does not start refer equipment to organizational maintenance.

ENGINE OVERHEATS.

- Step 1. Check level of coolant in radiator. If radiator is low check for leaks.
Refill radiator with proper coolant as described in paragraph 8-11.
- Step 2. Check engine oil level.
Add oil as detailed in L05-3810-295-12. Refer equipment to organizational maintenance if oil consumption is abnormally high.

LOW OIL PRESSURE

- Step 1. Check engine oil level.
Add oil as required.
- Step 2. Check for oil leaks.
Repair leaks as necessary.

BATTERIES DISCHARGE WITH ENGINE RUNNING.

- Step 1. Check alternator drive belt.
Have organizational maintenance tighten belt.
- Step 2. Visually check for loose connection.
Tighten loose connections.

ENGINE TENDS TO STALL AT FULL LOAD.

- Step 1. Check for dirty fuel filter.
Replace fuel filter.
- Step 2. Check air filter for dirt.
Clean air cleaner.

ROUGH OR ERRATIC ENGINE IDLING.

- Step 1. Check for dirty air cleaner.
Clean air cleaner.

General

section contains maintenance instructions covering the functions which the operator/crew perform as allocated by the MAC and which are not covered elsewhere in the manual. The scope of coverage is the same as presented in the MAC (see appendix B for applicable MAC).

Fuel Tank Inspection

Inspect fuel tank for cracks, breaks, dents or other damage that may cause leaks. Report any defects for direct support maintenance.

Fuel Lines and Fittings Inspection

Inspect all fuel lines and fittings for leaks, cracks, or other damage. Check for loose fittings. (Refer to paragraph 9-14.) Tighten all loose fittings and refer defective lines or fittings to organizational maintenance.

D. Air Cleaner Inspection

Inspect all fuel lines and fittings for leaks, cracks, or similar damage. Check for damaged hoses, loose hose clamps, damaged gaskets or any kind of leak that allows air to enter the engine without first passing through the air cleaner. Remove and inspect the air cleaner element as described in paragraph 932 b (5), (6) and (7). Refer any damage or defects to organizational maintenance for immediate repair.

1. Carrier Coolant System

Inspection.

(1) Before starting the engine (engine cold) remove radiator cap and check coolant level and condition. If coolant level is less than three-fourths of an inch above baffle plate or appears excessively dirty service the radiator as described in paragraph 8-11 b.

(2) Inspect fan blade for bent or other damaged condition. Check for loose mounting bolts, misalignment, or an unbalanced condition.

(3) With the engine running check the alternator for leaks. Check all hoses, connections, radiator cap for leaks. Check for leaks around thermostat, oil cooler, filter and water pump housing. If any leaks are noted tighten hose clamps.

sufficient warm-up time, report condition to organizational maintenance. If engine temperature exceeds 185°F. shut-down vehicle and service as directed in paragraph 8-11 b).

b. Service.

WARNING

If engine is hot extreme care must be taken when removing radiator cap. Hot coolant under pressure can be forced out when removing cap and cause serious burns.

(1) Drain cooling system by opening drain cock. If coolant is to be saved drain into a container of sufficient capacity.

(2) Clean cooling system by flushing as described in TB 750-651. Remove dirt and foreign material from between the radiator and water pump. Replace water filter as described in para 9-35.

(3) Close drain cock and refill the cooling system with an anti-freeze solution as detailed in TB 750-651. Insure the antifreeze mixture is sufficient to protect the engine at a temperature safely above the lowest expectant ambient weather conditions.

(4) Check cooling system for leaks at all connections and drain cock. Start carrier engine and allow to warm up. Recheck system for leaks and check level of coolant. If necessary add coolant to a level three-fourths of an inch above radiator baffle plate. If operating temperature exceeds 185°F. or if leaks exist report condition to organizational maintenance for repair.

8-12. Electrical System

a. Alternator Belts Inspection.

(1) Remove deck plates over engine (see paragraph 8-20).

(2) Check belts for cracks, breaks or fraying. Inspect belt adjustment by checking deflection of belts as illustrated on fig. 3-5.

NOTE

If belts are too loose, the alternator may not provide a proper charge to the battery. If the belts are too tight it may cause damage to the alternator pulley or bearing.

(3) Have organizational maintenance personnel replace damaged belts or adjust belts to proper tension.

2) Inspect battery cables for frays, breaks or connections. Check battery for broken terminal parts, cracks and other damage.

CAUTION

In freezing temperatures the engine shall be run at least one hour if distilled water is added to the batteries.

3) Remove the battery caps and check the electrolyte level. If electrolyte level is less than one-eighths of an inch above plates, add distilled water as necessary. Clean battery cap vent holes and install caps.

4) Remove corrosion from terminal lugs and battery cables. To aid in preventing further corrosion, lightly coat lugs and cables with type GAA grease as specified in LO 5-3810-295-12.

5) If additional testing or service is required, report condition to organizational maintenance for repair.

6) Reinstall cover on battery box and place battery disconnect switch to the "ON" position (3-4).

4. Propeller Shaft Service

Inspect propeller shaft for cracks, breaks or damage that may cause an out of balance condition. Check universal joints for damage, looseness in caps or loose hardware. Report any defects to organizational maintenance for repair.

Service the universal joints by lubricating in accordance with LO 5-3810-295-12-1, -2, 3.

5. Axle Assembly

Inspect the front and rear axle assemblies for grease or oil leaks or other damage. A leak will usually be indicated by a wet area. When a wet area is noticed it should be traced to the source of the leak. Report all leaks and damage to direct support maintenance.

6. Air Compressor Assembly

Inspect the air compressor for loose hardware, cracks, breaks or other damage that could cause an air leak. Check hose and hose clamps for leaks. Tighten hose clamps and report any damage to direct support maintenance.

Inspect air intake to ensure it is clean and free of obstructions. Clean as necessary.

Inspect the four wheels for broken welds, bent distorted beads, and loose wheel nuts. Check for loose or damaged ring locks. Report any defects to organizational maintenance.

8-17. Steering Assembly

a. Hose, Lines and Fitting Inspection. Inspect hoses, hoses, and fittings for leaks. Tighten loose fittings. Report any other damage to organizational maintenance. Refer to fig. 8-1.

b. Cylinder Inspection. Inspect hydraulic cylinders for leaks, cracks or breaks. Report any damage to the cylinder assemblies to support maintenance.

8-18. Outriggers and Floats

Inspect the outriggers and pads for rust, corrosion and broken or cracked welds. Check ball joint assembly and hardware for damage. Check float plate on floats for damage and loose mounting hardware. Tighten any loose hardware and report any damage to organizational maintenance.

8-19. Carrier Cab Assembly

a. Glass Inspection. Inspect all carrier glass for cracks and leaks around weather stripping. Check rubber stripping for cracks and other damage. Report any damage to organizational maintenance for replacement.

b. Seat Assembly Inspection. Inspect cushions for torn or ripped covers. Check seat frame for cracks, breaks or bent frame. Check seat belts for loose mounting, torn belts or defective latches. Report any damage to organizational maintenance.

8-20. Engine Deck Plates

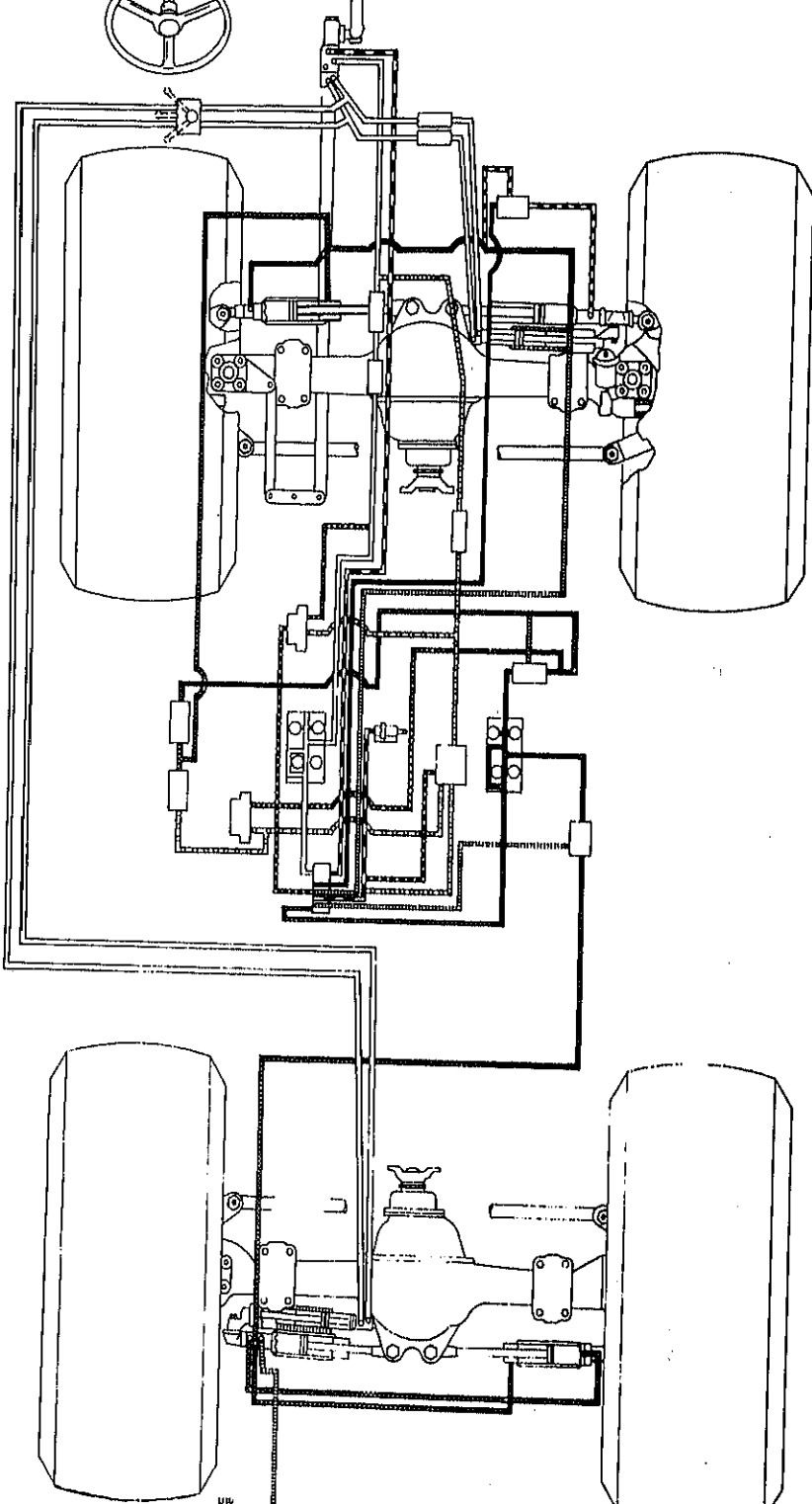
a. Removal. Remove engine deck plates as illustrated in figure 8-2.

b. Cleaning, Inspection.

(1) Clean deck plates with cleaning solvent (Fed. Spec. P-D-680 or equivalent) and dry thoroughly.

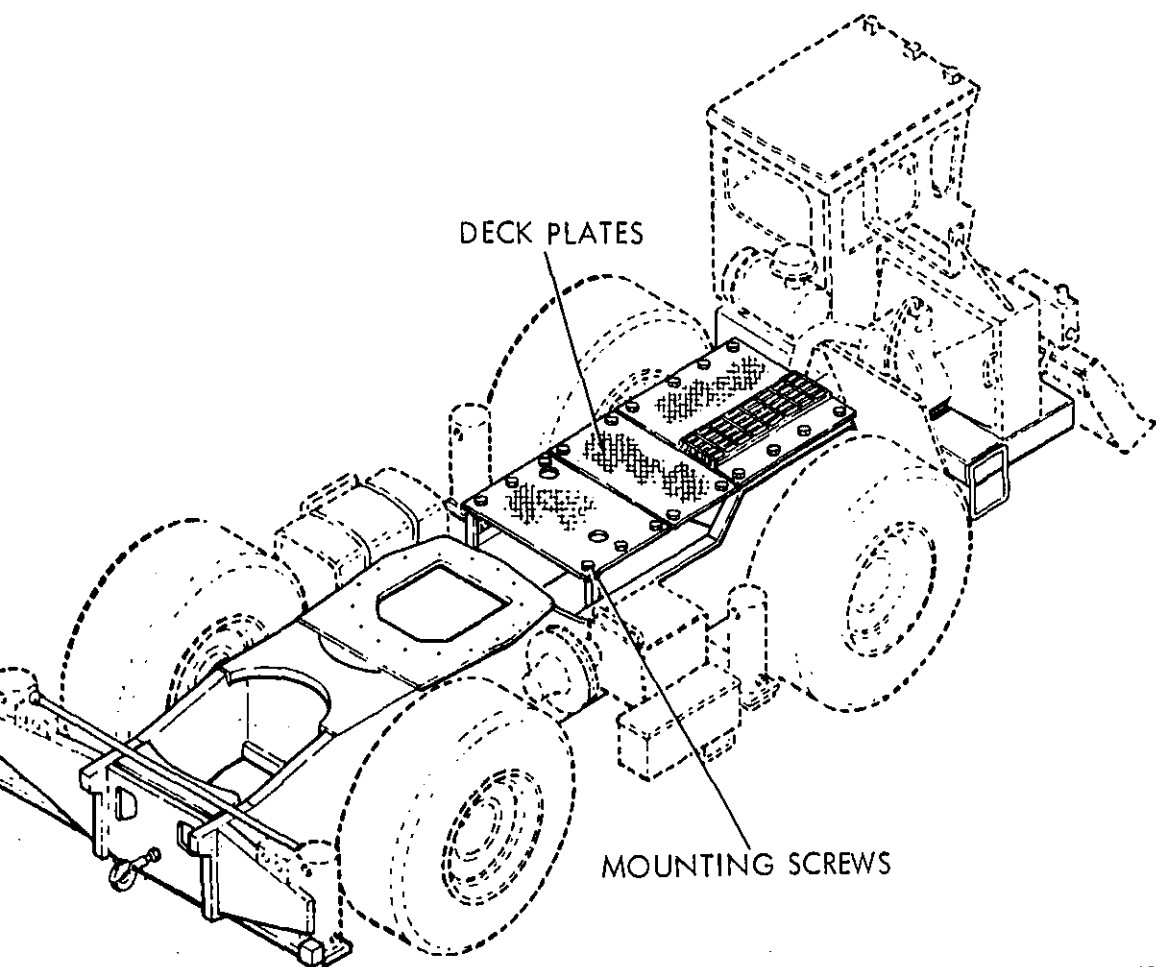
(2) Inspect deck plates for cracks, breaks or other damage. Replace damaged plates.

c. Installation. Refer to figure 8-2 and install engine deck plates as illustrated.



- STEERING CONTROL SYSTEM 650 PSI
- RETURN STEERING CONTROL SYSTEM
- STEERING SYSTEM 1850 PSI
- RETURN STEERING SYSTEM
- MANUAL STEERING OIL FLOW
- RETURN MANUAL STEERING OIL FLOW
- EMERGENCY STEERING SYSTEM
- PILOT PRESSURE EMERGENCY STEERING SYSTEM
- RETURN EMERGENCY STEERING SYSTEM

STEP 1. REMOVE MOUNTING SCREWS ON ALL DECK PLATES.
STEP 2. LIFT DECK PLATES FROM CARRIER.



(TA033060)

Figure 8-2. Engine deck plates, removal and installation.

Section I. SERVICE UPON RECEIPT OF MATERIAL

Inspecting and Servicing the Equipment

Refer to paragraph 4-1 for inspection and services performed on the equipment upon receipt of material.

9-2. Installation

Refer to paragraph 4-2 for installation of components shipped separately.

Section II. MOVEMENT TO A NEW WORK SITE

Dismantling for Movement

Refer to paragraph 4-3 and 4-4 for equipment dismantling instruction before movement to a new site.

9-4. Reinstallation after Movement

Refer to paragraph 4-2 for installation instructions after movement to a new work site.

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

Tools and Equipment

Refer to paragraph 4-6 for information pertaining to tools, equipment and repair parts issued with authorization for the M320RT Carrier.

required for organizational maintenance of M320RT Carrier.

9-7. Maintenance Repair Parts

Repair parts and equipment for the M320RT Carrier are listed and illustrated in the organizational maintenance repair parts and special tools list.

Special Tools and Equipment

There are no special tools or test equipment re-

Section IV. LUBRICATION INSTRUCTIONS

General Lubrication Information

Refer to paragraph 4-9 for general lubrication instructions.

9-9. Detailed Lubrication Information

Refer to paragraph 4-10 for detailed lubrication instructions.

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

General

Ensure that the M320RT carrier is operational at all times, it must be systematically inspected. Defects may then be discovered and corrected before serious damage or failure occurs. The neces-

is noted during operation that could cause damage to the equipment stop operation immediately. All deficiencies and short comings will be reported together with the corrective action taken on Form 2404 as soon as possible.

operation. Also be alert for unusual noises and/or vibration.

RADIATOR

Inspect for leaks and maintain coolant level three-fourths of an inch above baffle. Replace worn hoses and service radiator (refer to paragraph 9-36) as necessary.

Use a hydrometer and measure the coolant system's freezing point. Add anti-freeze to protect the cooling system to the lowest ambient temperature expected.

WATER FILTER

Replace cartridge every 250 hours or 3 months. Cartridge should be replaced whenever coolant is completely drained or replaced. Check for leaks whenever replacing cartridge.

DRIVE BELTS, ALTERNATOR AND WATER PUMP

Inspect belt deflection. Adjust belt tension if deflection exceeds one-fourth to one-half of an inch per foot of span. (See figure 3-5.)

Inspect belts for cracks and frays. Replace as required (see paragraph 9-40).

FUEL FILTERS

Drain water and sediment. Inspect filter for leaks. Repair as required. Replace secondary filter element and clean primary filter element and float tank filter screen every 250 hours. (Refer to paragraph 9-28.)

ENGINE OIL LEVEL

Check oil level. Add oil as required. If oil is excessively dirty, change oil and replace filter as described in paragraph 9-28.

BATTERIES

Inspect for loose cables and mountings. Tighten as necessary. Remove all corrosion and clean cap vent holes. Check batteries for cracks and leaks.

Add distilled water as required, to a level three-eighths of an inch above plates. In freezing weather run carrier engine a minimum of one hour.

Test specific gravity of electrolyte and recharge or replace as required.

TIRES AND WHEELS

Check tire pressure. Correct pressure is 55 psi. Inspect tires for excessive wear, cuts, breaks, embedded foreign material and missing valve caps.

FUEL TANK

Check fuel tank for loose mounting. Inspect for leaks, breaks or cracks. Tighten loose mounting. Replace if tank is leaking. Replace a defective cap gasket.

AIR CLEANER

Check level of oil in cleaner and add oil as required. Refer to L05-3810-295-12.

HYDRAULIC RESERVOIR

Check fluid level and add fluid as required. L05-3810-295-12. Check filter and service as described in paragraph 9-85.

LIGHTS

Inspect all light wiring for cracks, breaks and other damage. Check for loose connections. Check operation of all lights as described in paragraph 7-2.

BRAKES

Inspect brakes for proper operation as described in paragraph 7-2. Check air system for leaks and damage. Adjust brakes as described in paragraph 9-50.

WINDSHIELD WIPER

Inspect wiper blade and arm for damage. Replace all defective parts as necessary. Refer to paragraph 9-76.

FIRE EXTINGUISHER

Check fire extinguisher for broken seal.

OPERATOR'S CAB

Inspect operator's cab for cracked glass and damaged door. Replace glass and/or door as instructed in paragraph 9-69. and 9-70.

UTILITY BLADE

Inspect for cracked or broken welds, bent or damaged mounting brackets, and worn pivot pins. Check bushing for wear.

Inspect cutting edge of wear and loose or missing mounting bolts. The cutting edge should never be worn to the point that the blade is doing the cutting. If cutting edge is worn excessively it should be reversed

FRAME

Inspect frame for cracks, breaks or other damage. Check for loose or missing hardware. Inspect cradle for visible damage.

Refer any damage or defects to general support maintenance.

CRANKCASE BREATHER AND VALVE COVERS

Inspect breather for leaks, dents or other damage. Check to ensure breather is securely mounted. Tighten mounting and repair or replace as necessary. Service breather every 250 hours of operation. (L05-3810-295-12).

TORQUE CONVERTER

Inspect for dents, cracks or other damage that may cause leaks. Check to insure mounting is secure and converter has no leaks. Service in accordance with L05-3810-295-12.

ALCOHOL EVAPORATOR

Insure that evaporator is two-thirds full of pure methyl 188-proof alcohol. Alcohol must be free of any inhibitor.

Every 900 hours of operation the strainer in the bottom of the body should be removed and cleaned with cleaning solvent. Annually the evaporator should be disassembled and all parts cleaned and gaskets replaced. (See paragraph 9-52.)

Section VI. TROUBLESHOOTING**9-12. General**

This section provides information useful to organizational maintenance personnel in determining and correcting unsatisfactory operation or malfunctions of the M320RT carrier and its components. Any trouble beyond the scope of organizational maintenance as determined by the MAC (maintenance allocation chart) should be referred to direct support maintenance.

9-13. Organizational Maintenance Troubleshooting

Table 9-2, Troubleshooting, lists possible malfunctions followed by tests or inspections necessary to verify and isolate the malfunction. Also indicated are corrective actions required. Perform the tests, inspections and corrective actions in the order that they are listed. Any malfunctions not listed shall be checked on the MAC and referred to proper maintenance group.

Table 9-2. Troubleshooting Chart

| FUNCTION | TEST OR INSPECTION | CORRECTIVE ACTION |
|--|--|---|
| ENGINE WILL NOT CRANK. | | |
| | Step 1. Check to see if battery is discharged and electrolyte level is low. | Fill battery cell to three-fourths of an inch above baffle plates. Recharge batteries. |
| | Step 2. Check battery cables and ignition wiring for breaks, loose connections or corrosion. | Clean battery terminals. Replace damaged battery cables. Replace or repair other damaged ignition wiring. |
| | Step 3. Check to see if starter relay is engaging flywheel when starter button is depressed. | A spinning or clicking sound indicates a faulty starter relay. Replace starter relay as described in paragraph 9-41. |
| ENGINE CRANKS, BUT TOO SLOW TO START. | | |
| | Step 1. Check battery for insufficient charge. | Recharge battery. |

- Step 1. Check fuel tank level.
Refill fuel tank.
- Step 2. Check air cleaner and air intake lines for damage, clogging or obstructions.
Clean lines and service air cleaner as described in paragraph 3-11.
- Step 3. Check fuel filter for dirty element or clogged lines.
Service fuel filter as described in paragraph 9-28.
- Step 4. Check fuel pump, and injector for faulty operation.
To repair fuel pump and injections refer defects to direct and general support.
- Step 5. In cold weather check the cold weather starting aid for proper operation.
Replace damage cable controls. Clean clogged lines and replace faulty cartridge as described.

ENGINE OVERHEATS.

- Step 1. Check coolant level.
Add water to radiator if level is low. Determine cause of low coolant level and repair or service.
- Step 2. Check fan and water pump V-belt tension.
Adjust V-belt tension as described in paragraph 9-37.
- Step 3. Check radiator and coolant, as coolant may be excessively dirty and radiator may be clogged.
Drain and flush radiator as described in paragraph 8-11.
- Step 4. Check hoses for leaks or a collapsed condition.
Replace damaged hoses.
- Step 5. Remove and test the thermostat as described in paragraph 9-34.
- Step 6. Remove and check water pump for damaged parts or a defective impeller.
Replace defective water pump as described in paragraph 9-37.

ENGINE FAILS TO REACH OPERATING TEMPERATURE.

- Step 1. Thermostat may be stuck open or removed from vehicle. Remove thermostat housing and check thermostat.
Replace defective thermostat.
- Step 2. Check for excessive leakage at the thermostat seals.
Replace thermostat seals as described in paragraph 9-34.

LOW OIL PRESSURE.

- Step 1. Check for leaks in oil lines. Replace damaged parts and/or tighten loose connections.
- Step 2. Check quality of oil. If oil is dirty, oil filter may be clogged.
Drain oil and change filter as described in paragraph 9-28.
- Step 3. Check oil viscosity. If oil is too thin it will cause low oil pressure.
Refer to LO5-3810-295-12 for proper grade of oil. Drain and refill crankcase with correct oil as described in paragraph 9-23.

BATTERIES DISCHARGE WITH ENGINE RUNNING.

- Step 1. Check electrical connections for loose or broken wires.
Repair broken wires, tighten loose connections.
- Step 2. Check to see if alternator V-belt is loose or broken.
Adjust V-belt tension if loose. Replace broken belt.
- Step 3. Check to see if alternator brushes are excessively worn.
Replace worn brushes.
- Step 4. Check to see if alternator is charging with proper voltage applied.
Replace a defective alternator.

direct support maintenance.

Step 2. Check quality and grade of oil being used for specific weather.

Replace oil with proper quality and grade of lubricating oil as described in the current lubrication chart.

ENGINE NOISY.

Step 1. Check to see if tappet clearance is excessive.

Refer to direct support maintenance for tappet adjustment.

Step 2. Check to see if proper octane fuel is being used.

Fill fuel tank with proper octane fuel.

Step 3. Check to see if connecting rod bearings or main bearings are damaged.

Report condition to direct support maintenance for repair.

ROUGH OR ERRATIC ENGINE IDLING.

Step 1. Check to see if intake manifold is leaking.

Refer to direct support maintenance for defective manifold replacement.

Step 2. Check to see if air cleaner is dirty.

Clean dirty air cleaner.

Step 3. Check to see if carburetion is faulty

Replace defective carburetor.

ENGINE STALLS INTERMITTENTLY AT FULL LOADS.

Step 1. Check to see if air cleaner is dirty.

Clean dirty air cleaner.

Step 2. Check to see if fuel filters are dirty.

Replace dirty fuel filter elements.

Step 3. Check to see if fuel pump is faulty.

Replace faulty fuel pump.

ENGINE "CUTS OUT" SUDDENLY.

Step 1. Check all fuel lines for restriction.

Replace defective fuel line.

Step 2. Check fuel and fuel tank for dirt.

Drain and refill fuel tank with clean fuel.

Step 3. Check to see if fuel pump is faulty.

Replace defective fuel pump.

ENGINE EXHAUST IS SMOKING.

Step 1. Check to see if ignition is timed properly.

Adjust ignition timing.

Step 2. Check to see if spark plugs are defective.

Replace defective spark plugs.

Step 3. Check to see if air cleaner is dirty.

Clean dirty air cleaner.

Step 4. Check for faulty carburetion.

Replace defective carburetor.

BRAKE PRESSURE INCORRECT.

Step 1. Check governor for incorrect pressure range.

Readjust governor.

Step 2. Check air system for leaks and/or faulty compressor.

Repair any air leaks, replace a faulty compressor.

POWER STEERING IS NOISY AND/OR IS SPONGY.

Step 1. Check power steering fluid level.

- Step 1. Check steering fluid reservoir for an overfull condition.
Remove steering fluid until it reaches the full mark.
- Step 2. Check for clogged steering fluid filter.
Clean or replace steering filter.

BRAKES GRAB WHEN APPLIES.

- Step 1. Check to see if brakes are properly adjusted.
Adjust brakes.
- Step 2. Check brake linings to see if they are excessively worn.
Replace worn or defective brake shoes.

Section VII. MAINTENANCE OF RADIO INTERFERENCE SUPPRESSION

4. General

electrical disturbances in the radio frequency range, which are generated by the M320RT truck engine and may interfere with radio receivers or other electronic equipment, must be effectively reduced or eliminated. These disturbances are suppressed by providing a low resistance path to ground for stray currents. This is achieved by grounding the ignition and high frequency wires,

grounded to the frame with bonding straps and the use of capacitors and resistors.

9-15. Inteference Suppression Components

Radio interference suppression components on the M320RT carrier are the same as described for the crane. Refer to part I, chapter 3, section V for a detailed description.

Section VIII. MAINTENANCE OF ENGINE ASSEMBLY

5. General

This section and subsequent sections in this chapter provide maintenance procedures for all items which are the responsibility of organizational level personnel as allocated by the maintenance allocation chart (MAC).

7. Carrier Engine

General. The carrier is equipped with an Isuzu-Cummins Model V-903 direct injection diesel engine. The engine is used to power the carrier and all accessories attached to the carrier.

Inspection. It is the responsibility of organizational maintenance personnel to inspect the en-

gine assembly for oil, fuel, and coolant leaks. Check all tubes, hoses, connections and fittings. Drive belts must be inspected for frays or breaks. Inspect for any other signs of damage or excessive wear to the engine or engine accessories. Refer to appropriate sections of this chapter for repair and replacement instructions. If the appropriate instructions are not contained in this chapter, refer to the malfunction or damage to direct and ground support maintenance personnel for correction.

c. Testing. Test the carrier engine function periodically to insure proper operation of the engine assembly. Refer to chapter 7 for description and normal operating readings of all engine gauges and controls.

Section IX. MAINTENANCE OF EXHAUST SYSTEM

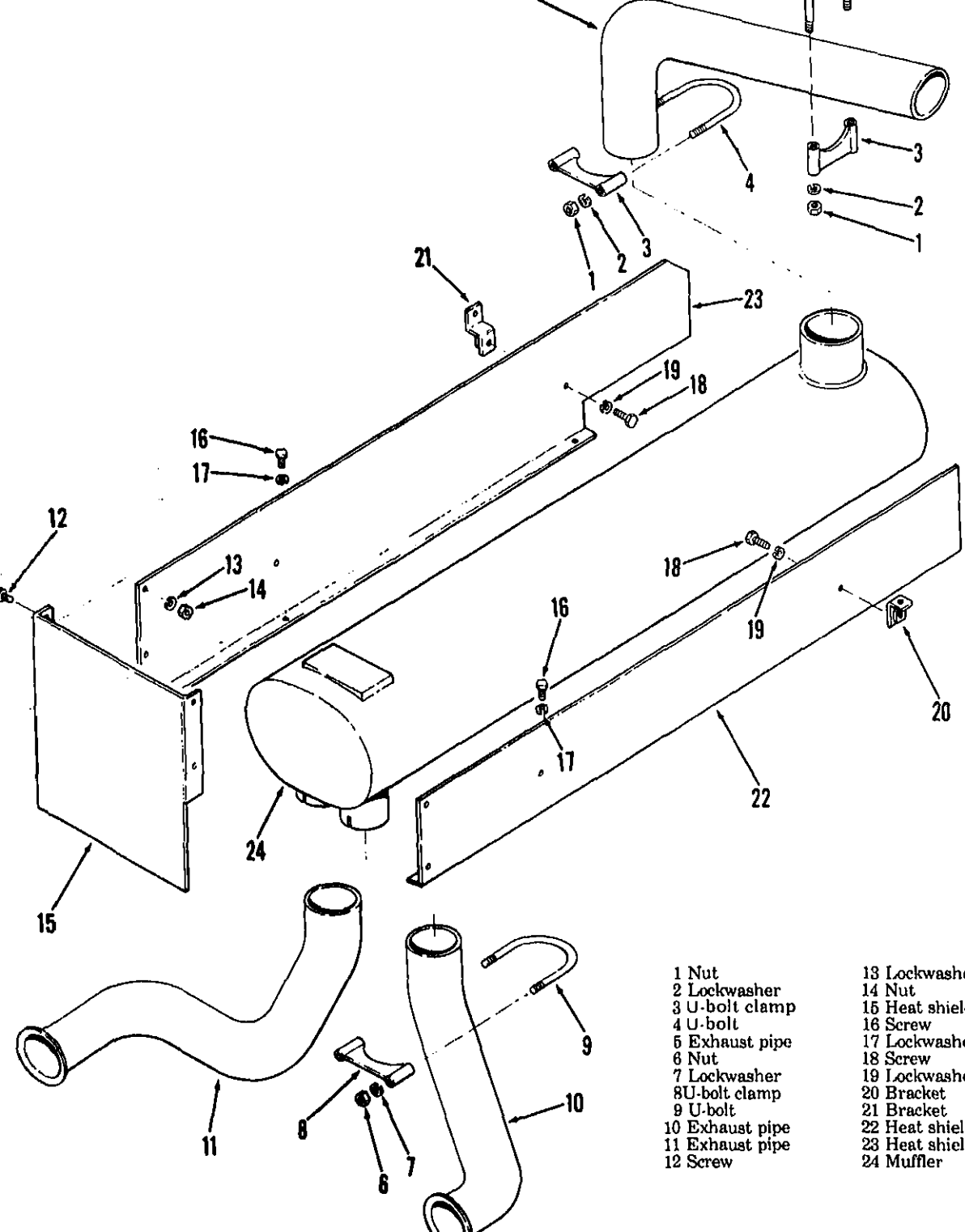
8. General

The carrier exhaust system consists of three exhaust pipes and a muffler. The muffler is mounted in the engine compartment under the engine deck plates. Protective heat shields are placed around the muffler to prevent damage to its near the muffler from excessive heat.

sufficient time must elapse from engine shutdown to allow the entire exhaust system to cool.

a. Removal. Refer to figure 9-1 and remove the carrier exhaust system as follows:

(1) Remove the engine deck plates attached to the carrier.



- 1 Nut
- 2 Lockwasher
- 3 U-bolt clamp
- 4 U-bolt
- 5 Exhaust pipe
- 6 Nut
- 7 Lockwasher
- 8 U-bolt clamp
- 9 U-bolt
- 10 Exhaust pipe
- 11 Exhaust pipe
- 12 Screw

- 13 Lockwasher
- 14 Nut
- 15 Heat shield
- 16 Screw
- 17 Lockwasher
- 18 Screw
- 19 Lockwasher
- 20 Bracket
- 21 Bracket
- 22 Heat shield
- 23 Heat shield
- 24 Muffler

Cleaning and Inspection.

(1) Using a wire brush, clean all components of the engine exhaust system.

(2) Inspect muffler and exhaust pipes for cracks, breaks or other damage.

(3) Inspect all hardware and threaded parts for thread damage.

(4) Replace all parts found to be defective or showing excessive thread damage.

c. Replacement. Refer to figure 9-1 and replace the muffler and exhaust pipes as follows:

(1) Assemble brackets (20 and 21) to heat shields (22 and 23). If they were removed. Secure with screws (18) and lockwashers (19).

Section X. MAINTENANCE OF LUBRICATION SYSTEM

20. General

a. The carrier engine lubrication system maintains proper oil pressure at the operating units, filters the oil, assures proper oil temperature, and provides the means of draining, replenishing, and measuring the oil in the engine crankcase.

b. The components to be maintained by the organizational maintenance personnel include the oil filter assembly and external lines. Inspection of the oil cooler and oil pan is the responsibility of the organizational maintenance personnel.

21. Oil Pan Inspection

Inspect the oil pan for leaks or any physical damage. Any damage or oil leaks shall be reported to the direct support maintenance personnel.

22. Oil Cooler Inspection

Inspect oil cooler (fig. 9-2) for oil leaks, or other physical damage. Any oil leaks or damage to the cooler shall be reported to the direct support maintenance personnel.

23. Oil Filter Service and Maintenance

a. Inspection and Service. Inspect and service the oil filter and system as follows:

(1) Remove the dipstick (fig. 9-3) and wipe the pan. Reinsert it into the dipstick tube and then

lockwashers (19).

(4) Place muffler (24) on exhaust pipes (10 and 11) and secure with U-bolts (9), clamps (10), and lockwashers (7) and nuts (6).

(5) Install exhaust pipe (5) on muffler (24) and secure with U-bolt (4), clamps (3), lockwashers (7), and nuts (11).

(6) Assemble rear heat shields (15) to heat shields (22 and 23) and secure with screws (18), lockwashers (13) and nuts (14).

(7) Reinstall the engine deck plates as instructed in paragraph 8-20.

remove to check level and condition of the lubricating oil.

NOTE

Engine must be shut down several minutes prior to checking oil. This allows the lubricating oil to drain into the oil pan for an accurate reading on the dipstick.

(2) When the oil level is below the low oil indicator mark on the dipstick, refer to L05-3810-12 and add the appropriate oil to maintain proper oil level.

(3) When the oil is excessively dirty it must be changed as described in this section.

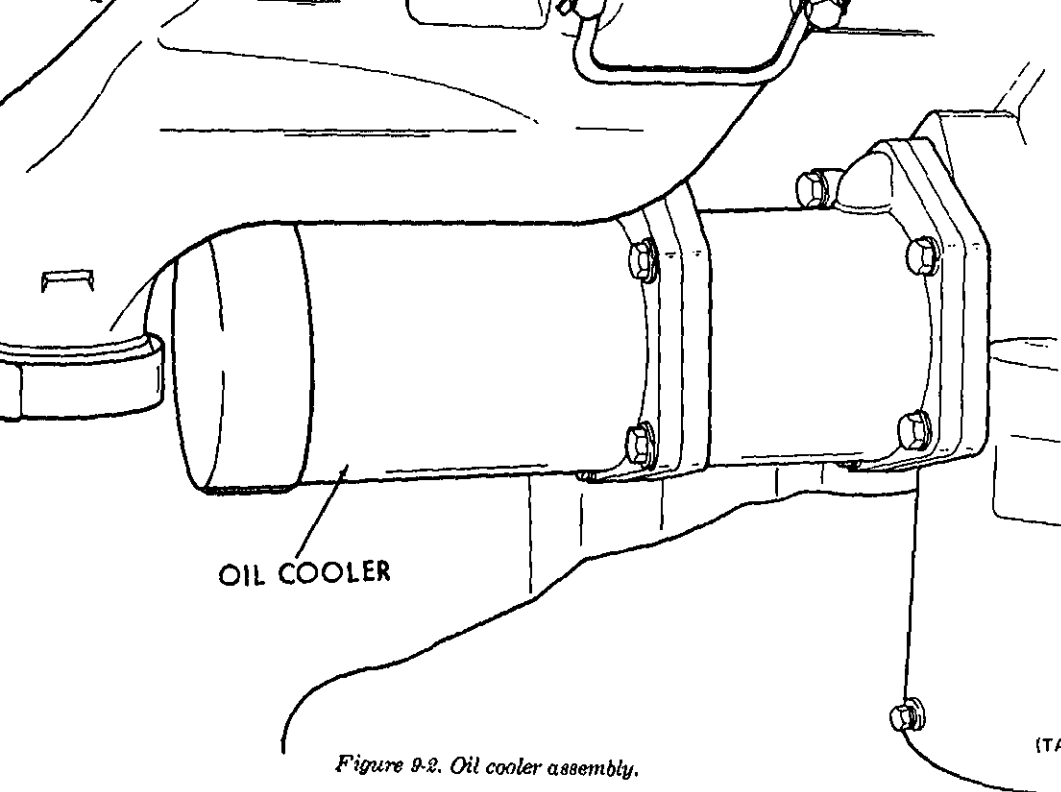
(4) Inspect filter housing and all oil lines for cracks, leaks or other damage. Replace any defective lines or housings as required.

b. Removal. When the oil filter is removed, lubrication oil must be changed. Remove and disassemble the oil filter and change oil as follows:

NOTE

It is recommended that in cold ambient temperatures the engine be run a sufficient length of time to warm the engine oil before draining.

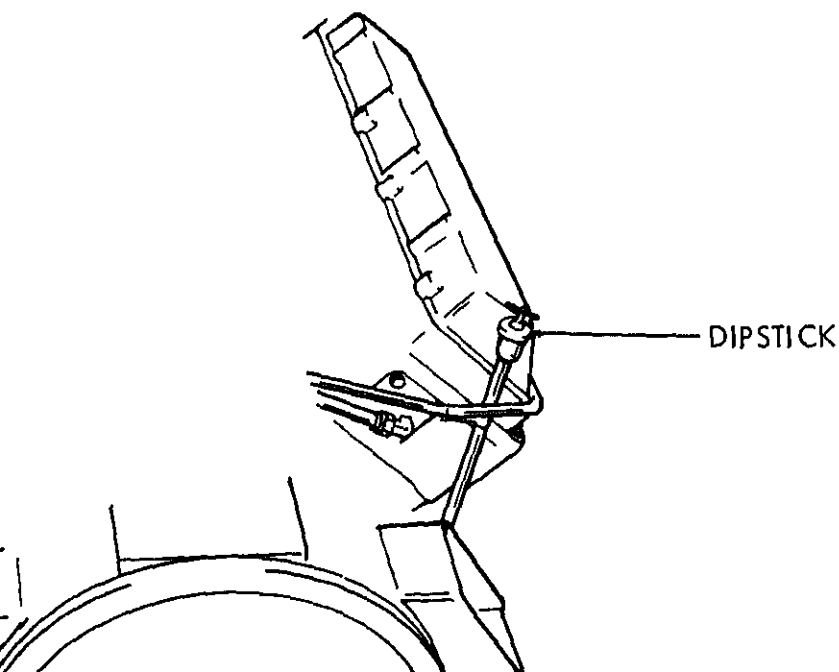
(1) Using a suitable size container, drain the engine oil by removing oil drain plug (fig. 9-4). Replace the drain plug after the oil has been completely drained.



OIL COOLER

Figure 9-2. Oil cooler assembly.

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DIPSTICK

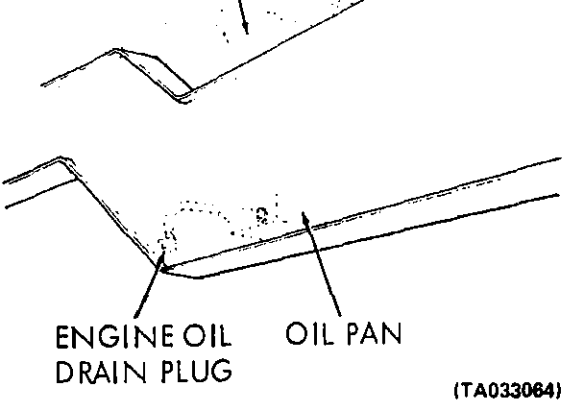


Figure 9-4. Engine oil drain plug.

(3) Clean all dirt around filter head (1) and filter body (4).

(4) Loosen center bolt (5) and remove filter body (4), oil cartridge (3) and gaskets (13). Inspect oil cartridge for inspection and discard gaskets.

(5) To remove oil filter assembly disconnect lines and remove attaching screws (fig. 9-5).

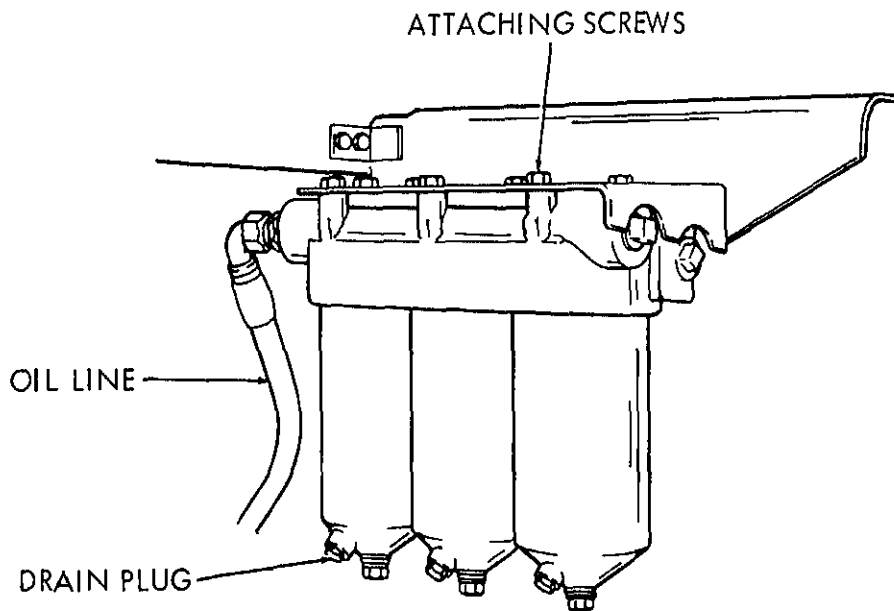


Figure 9-5. Oil filter assembly, removal and installation.

c. *Disassembly.* Refer to figure 9-6 and disassemble the oil filter assembly as follows:

(1) With the oil cartridge assembly removed continue to disassemble the oil filter if required by removing retaining rings (6, fig. 9-6) from center

(12) from filter bodies.

d. *Cleaning, Inspection and Repair.*

(1) Clean all metallic portions of the oil filter assembly with cleaning solvent (Fed. P-D-680 or equivalent) and dry thoroughly.

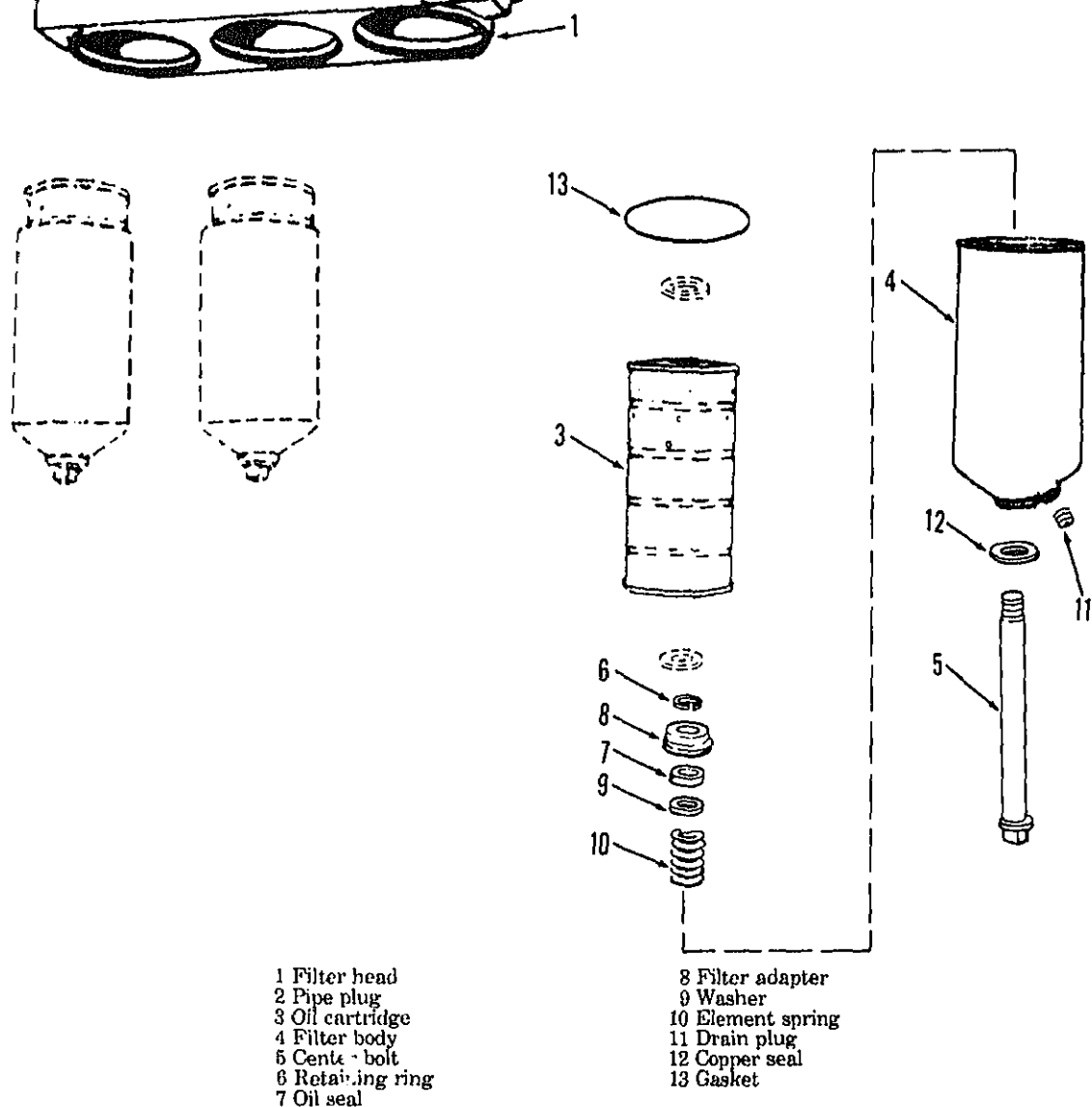


Figure 9-6. Lubricating oil filter, exploded view.

(3) Inspect springs for damage or loss of resiliency. Check all other parts for cracks, breaks or other damage.

(4) Repair is limited to the replacement of all cartridges, gaskets, oil seals and defective parts.

e. Reassembly. Refer to figure 9-6 and reassemble the oil filter assembly as follows:

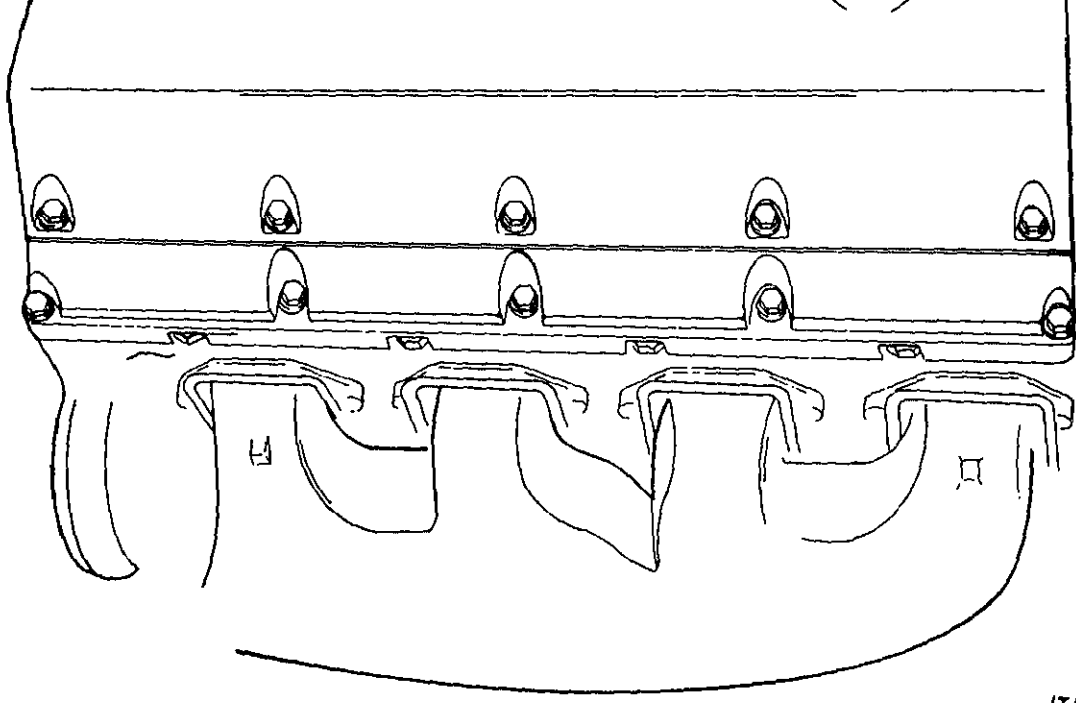
(1) Install copper seals (12) on center bolts (5) and slide center bolt into filter bodies (4).

(5) and place gaskets (13) on filter bodies. Tighten filter body assemblies on filter head and tighten center bolts (5).

(4) If removed, assemble pipe plug (2) on filter head (1) and drain plug (11) to filter body (4).

f. Installation.

(1) Secure oil filter assembly to engine with attaching screws (fig. 9-5) and reconnect lines.



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Figure 9-7. Oil filler tube.

(3) Start engine and check entire lubrication system for oil leaks. Special attention shall be given to the oil filter assembly and oil pan drain plug when checking for oil leaks.

(4) Shutdown engine, allow sufficient time for oil to drain into the oil pan, and check the oil level and replenish if necessary.

Section XI. MAINTENANCE OF ROCKER ARM COVERS

24. General

The carrier engine has two rocker arm covers. An oil filler cap is provided in the right hand cover.

25. Rocker Arm Covers

a. Removal and Disassembly.

(1) Remove carrier deck plate over engine.
(2) Disconnect and cap all hoses, tubes and connectors necessary to remove the engine rocker arm covers.

(3) Remove screws (1, fig. 9-8), lockwashers (2) and washers (3) and remove rocker arm covers (4 and 5).

b. Cleaning, Inspection and Repair.

(1) Clean all metallic parts of the rocker arm covers with cleaning solvent (Fed. Spec. P-D-6 or equivalent) and dry thoroughly.

(2) Inspect rocker arm covers for cracks, breaks or other damage. Check for thread damage on all hardware.

(3) Repair is limited to replacement of parts found to be defective.

c. Reassembly and Installation.

(1) Reassemble oil filler tube (8, fig. 9-8) and oil filler cap (7) to cover (4).

(2) Install new gaskets (6) and assemble r

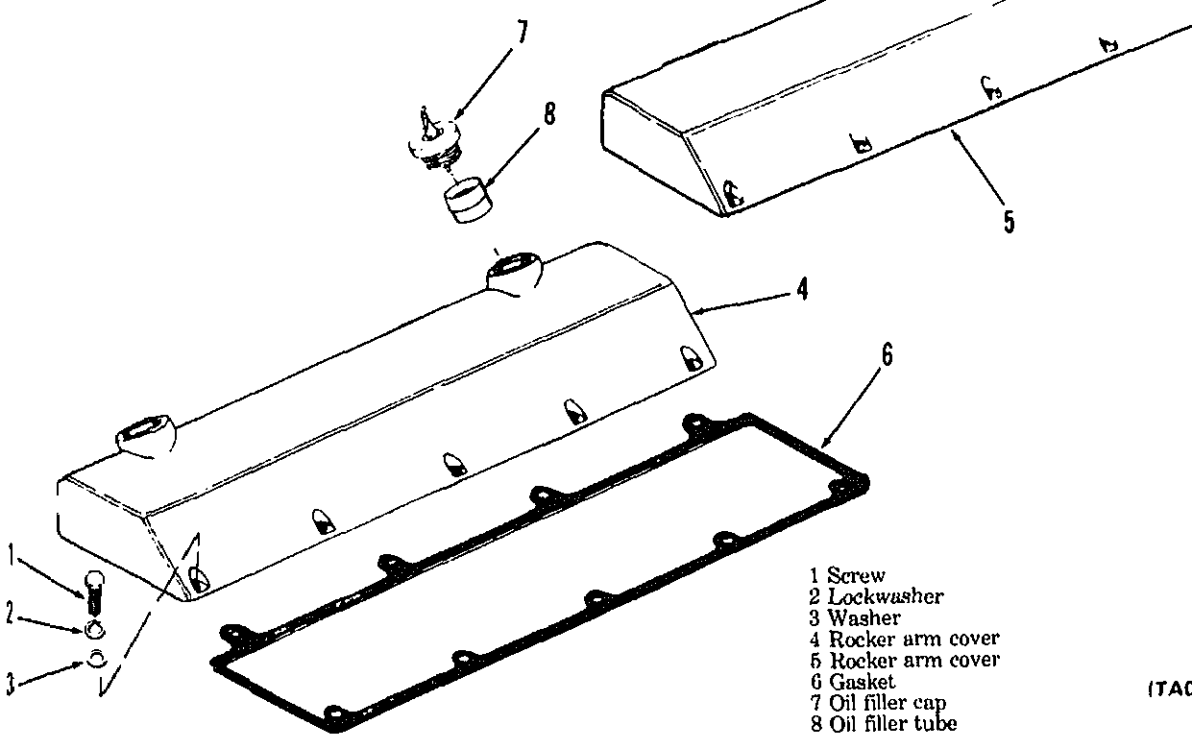
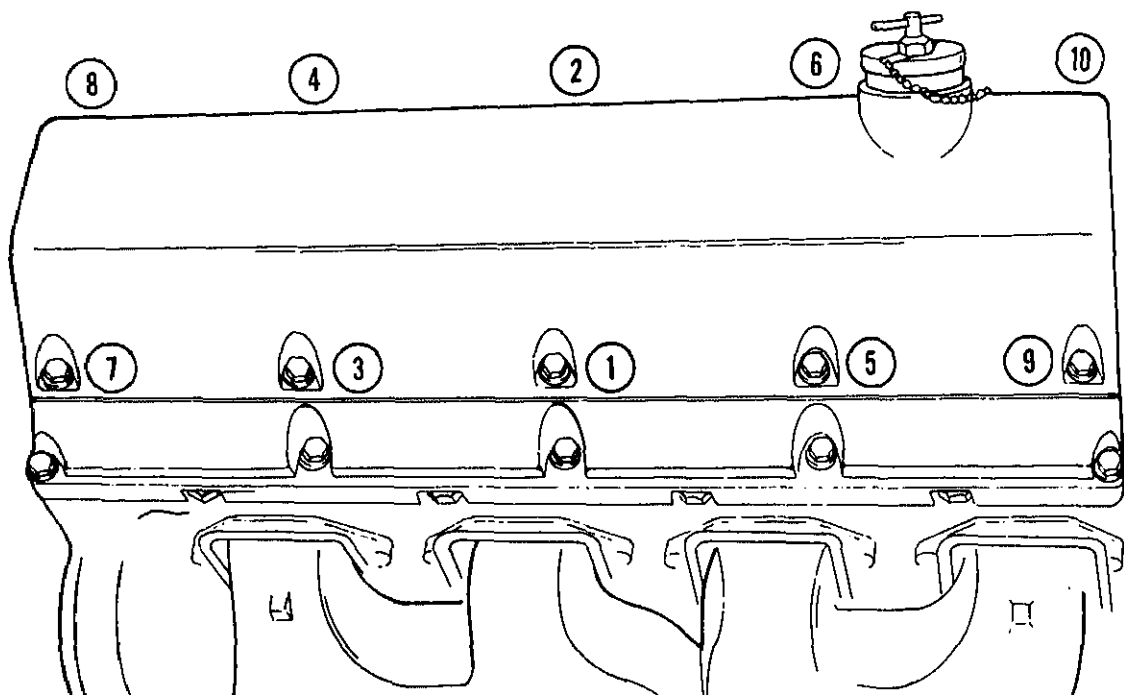


Figure 9-8. Engine rocker arm covers, removal.



26. General

- a. The fuel system is a "pressure-time" (PT) system which is based on the principle that the volume of liquid flow is proportionate to the fluid pressure, the time allowed to flow and the passage through which the liquid flows.
- b. The fuel system consists of the fuel tank, fuel filters, fuel pump, injector supply and drain lines and injectors. Also included in this section is maintenance of the starting aids and throttle controls and linkage.
- c. The fuel pump draws fuel from the fuel tank

through the fuel filters and delivers it to the injectors under controlled pressure. The injectors receive the low-pressure fuel from the fuel pump and deliver it into the combustion chamber at the proper time, in equal quantities and burn in proper condition. A common drain line returns fuel injected, to the fuel tank.

9-27. Fuel Pump Inspection

Inspect fuel pump (fig. 9-10) for any fuel leaks or other physical damage. Any fuel leaks or damage to the fuel pump, shall be reported to the direct support maintenance personnel.

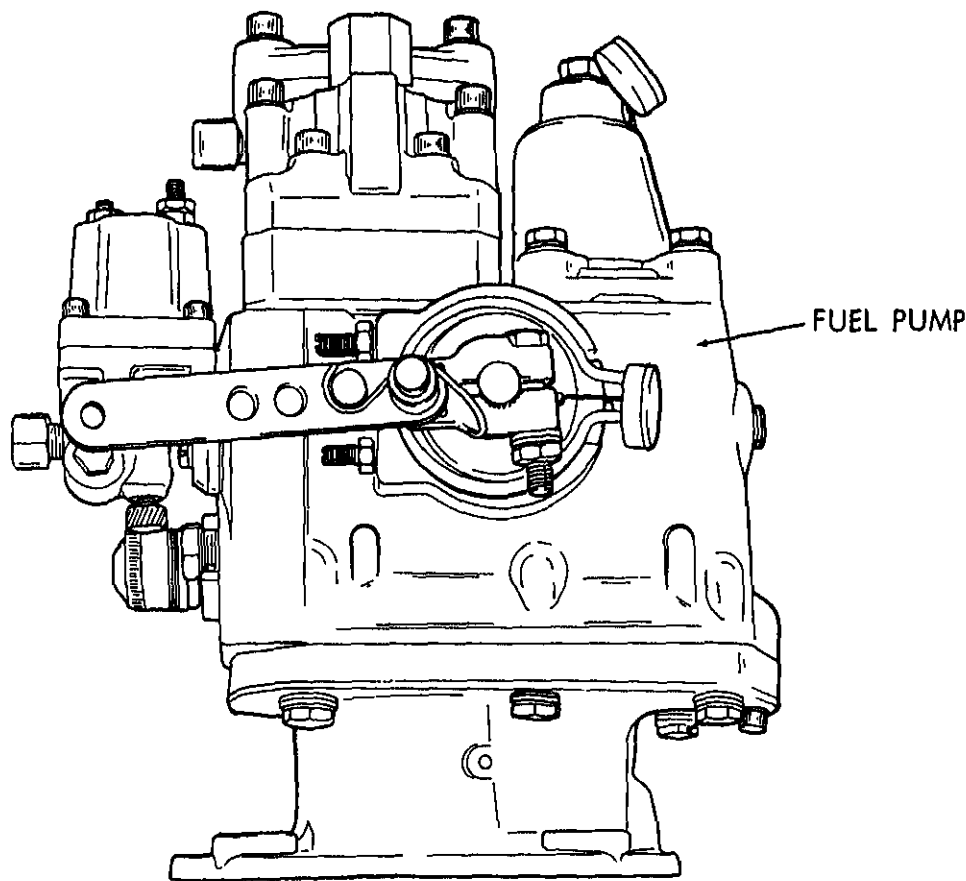
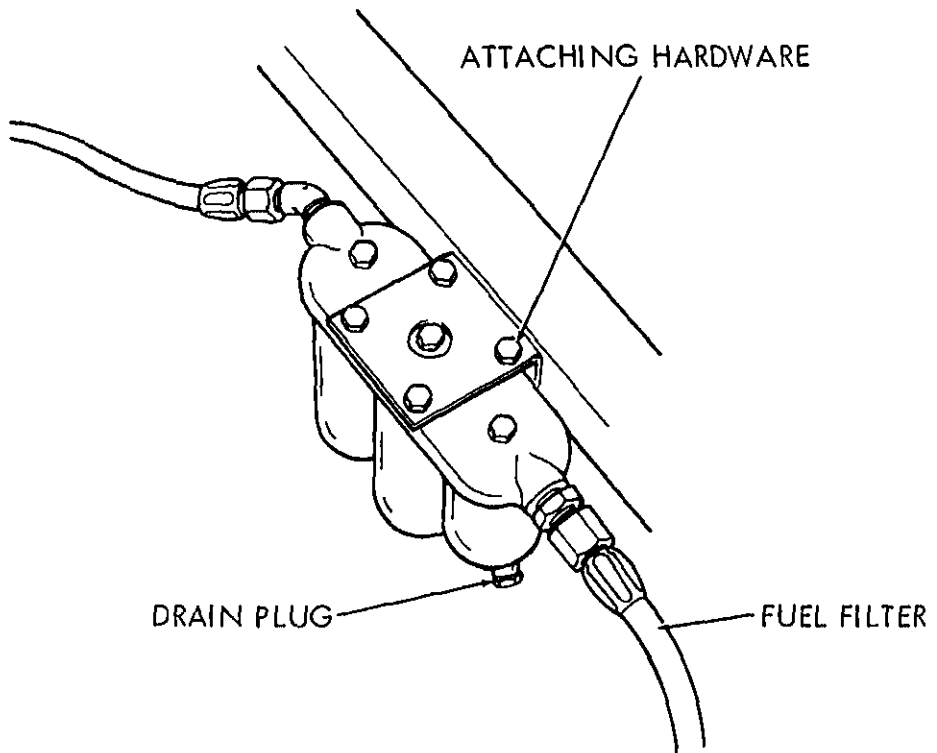


Figure 9-10. Fuel pump assembly.

(1) Remove the engine deck plates.
 (2) Drain the fuel from the filter assembly into suitable sized container. Care should be taken

(4) Remove capscrews (19, 9, fig. 9-12) and washers (20, 8) and lift filter assembly from



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Figure 9-11. Fuel filter, removal and installation.

Disassembly. Refer to figure 9-12 and disassemble the fuel filter assembly as follows:

(1) Remove screws (9) and washers (8) and remove filter body assemblies (2 and 3).

(2) Remove drain plugs (4) from filter bodies

(3) Remove filter elements (6) from bodies (5) and remove and discard gaskets (7).

(4) Remove nut (10) and washer (11) and slide (12), plunger (14) and strainer (15) from stud (16).

(5) Remove strainer (15) and plunger (14) from (12). Remove drain plug (13) from body (12) and discard gasket (18).

(6) Remove stud (16) and nut (17) from fuel head

fig. 9-12) by reverse flushing.

(2) Inspect all parts for damage or defects. Replace all hardware for thread wear or other damage.

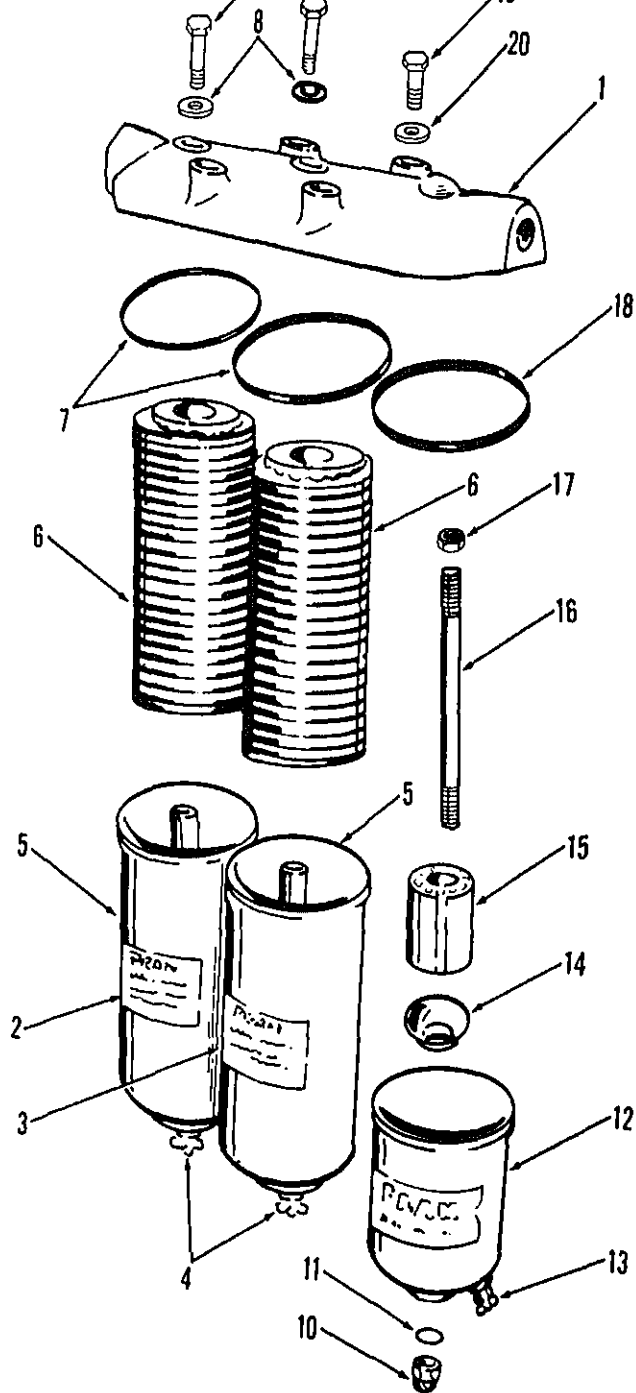
(3) Replace all gaskets and filter elements. One pair is limited to the replacement of damaged defective parts.

e. Reassembly. Refer to figure 9-12 and reassemble the fuel filter assembly as follows:

(1) Assemble stud (16) and nut (17) to filter head (1).

(2) Install drain plug (13) into body (12) and install new gasket (18) into body (12) and place new gasket (18) into filter head (1).

(3) Slide plunger (14) and strainer (15) onto



1 Filter head
2 Body assembly

8 Washer

15 Strainer

Installation. Refer to figure 9-11 and install the filter assembly as follows:

- (1) Position filter assembly on carrier and secure attaching screws (19, fig. 9-12).
- (2) Connect all fuel lines that were disconnected during the removal procedure.
- (3) Start carrier engine and check filter assembly fuel line connections for fuel leaks. Correct any leaks.
- (4) Install deck plates over carrier engine assembly.

Fuel Tank, Lines and Fittings

Fuel Tank Service. If water or other contaminants found in the carrier fuel, the fuel tank should be drained and refilled as follows:

- (1) Place a container of sufficient capacity under the fuel tank and remove the drain plug. (fig. 9-13).

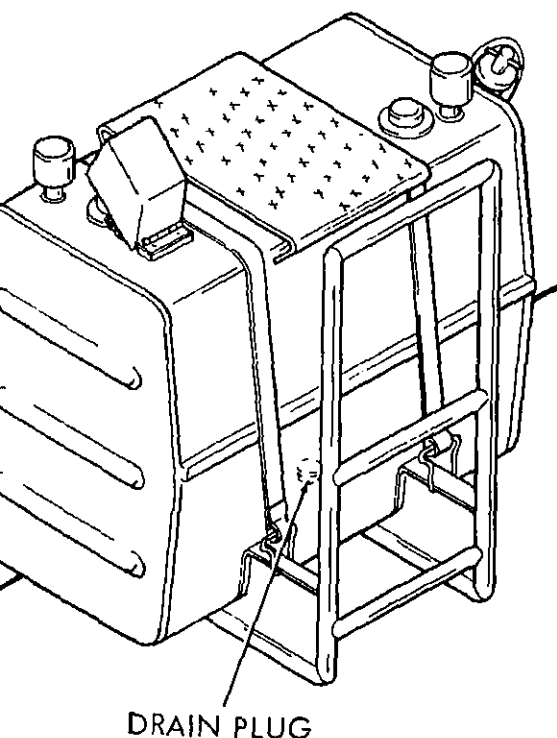


Figure 9-13. Fuel tank drain plug.

9-30. Starting Aid Assembly

a. Removal and Disassembly. Refer to figure 9-15 and remove and discard carrier engine starting aid as follows:

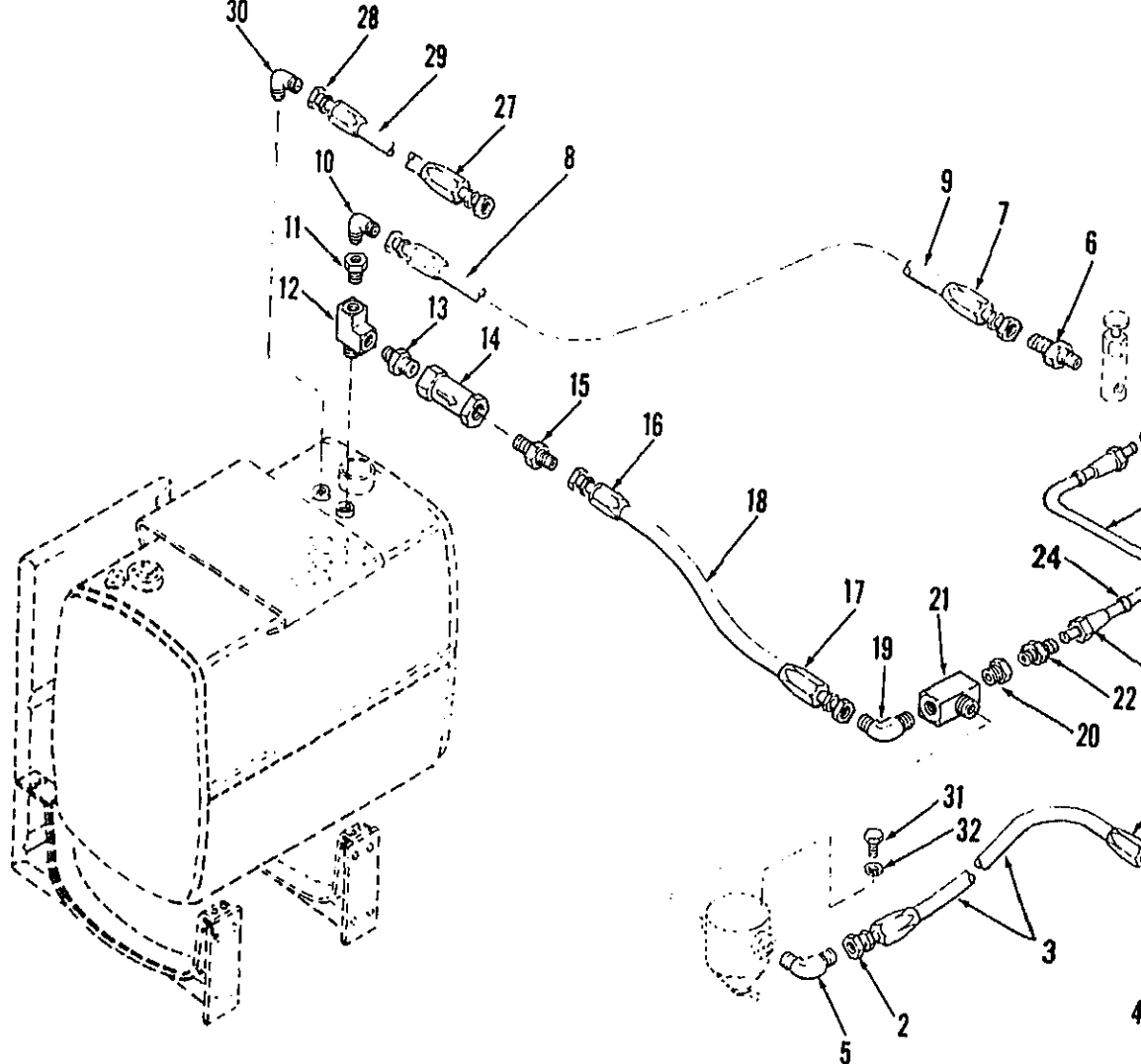
- (1) Remove nuts (3), lockwashers (2), screws (1). Remove screws (4) and cable stop (5).
- (2) Remove screw (6) from starting valve assembly. Remove clamp (23) and lift control assembly from carrier cab.
- (3) Remove clamps (24), copper tube atomizers (9) and tube tee (10) from starting aid valve (22).
- (4) Remove wing nuts (13), lockwashers (14) and clamp bracket (14) from studs (16).
- (5) Remove nuts (11), lockwashers (12), clamp plate (15), and studs (16).
- (6) Unscrew ether cylinder (17) from starting aid valve (22).
- (7) Remove screws (19), lockwashers (20), nuts (21) and remove bracket (25). Lift starting aid valve (22) from carrier.

b. Cleaning, Inspection, Repair.

- (1) Clean all metallic parts of the starting aid assembly with cleaning solvent (Fed. Spec. P-D-680 or equivalent) and dry thoroughly.
- (2) Inspect all components of the starting aid assembly for cracks, breaks or other damage.
- (3) Repair of the starting aid assembly is limited to the replacement of any defective parts.

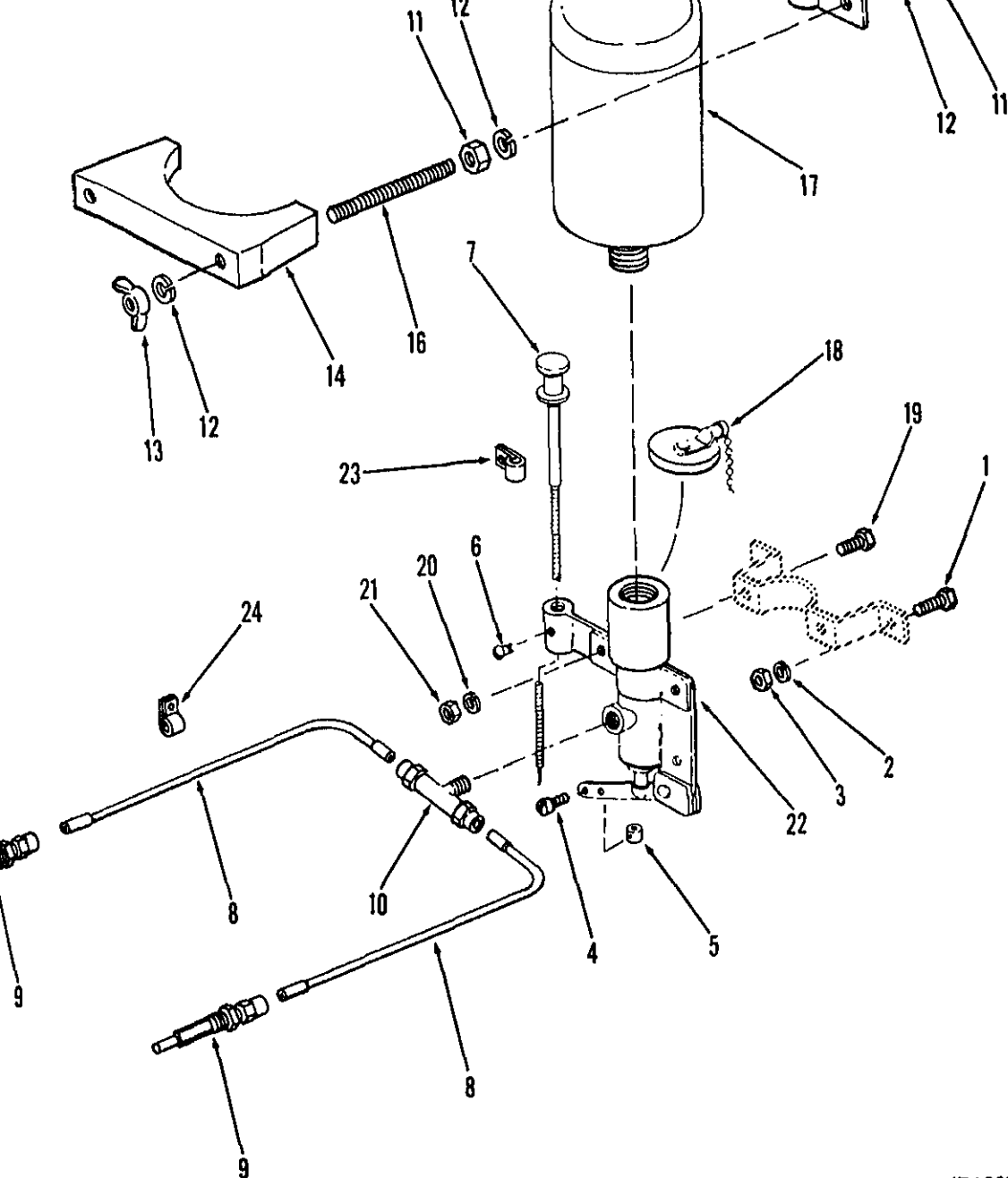
c. Reassembly and Installation. Refer to figure 9-15 and reassemble and install the starting aid as follows:

- (1) Install bracket (25) on starting aid valve and secure with nuts (21), lockwashers (20) and screws (19).
- (2) Install clamp plate (15) on carrier cab studs (16), lockwashers (12) and nuts (11).
- (3) Install tube tee (10) on starting aid valve (22) and position valve in place. Secure with screws (1), lockwashers (2) and nuts (3).
- (4) Assemble control assembly (7) in carrier cab and install clamp (23).
- (5) Install cable through valve assembly and secure with screw (6).
- (6) Adjust cable stop on control assembly.



- 1 Coupling
- 2 Coupling
- 3 Rubber hose
- 4 Elbow
- 5 Elbow
- 6 Hose adapter
- 7 Coupling
- 8 Band marker
- 9 Rubber hose
- 10 Elbow
- 11 Brass bushing
- 12 Pipe tee

- 17 Coupling
- 18 Rubber hose
- 19 Elbow
- 20 Brass bushing
- 21 Pipe tee
- 22 Adapter
- 23 Nut
- 24 Band marker
- 25 Copper tube
- 26 Elbow
- 27 Coupling
- 28 Coupling
- 29 Coupling
- 30 Coupling
- 31 Nut
- 32 Coupling



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1 Screw
2 Lockwasher
3 Nut
4 Screw
5 Cable stop
6 Screw
7 Control assembly
8 Copper tube

10 Tube tee
11 Nut
12 Lockwasher
13 Wing nut
14 Clamp bracket
15 Stud
16 Clamp plate
17 Ether cylinder

19 Screw
20 Lockwasher
21 Nut
22 Starting valve
23 Clamp
24 Clamp
25 Bracket

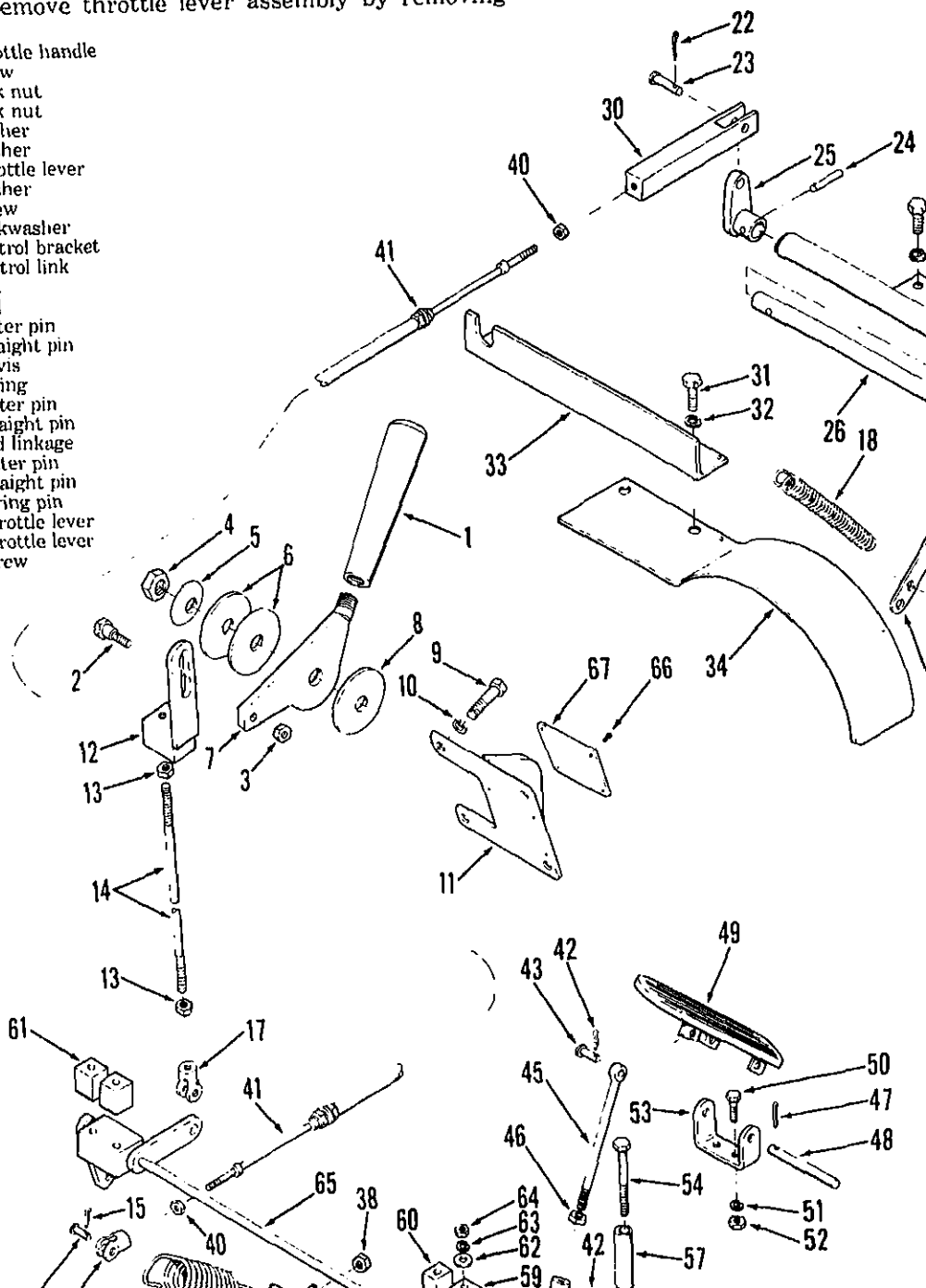
9-51. Throttle Control Linkage

a. Removal. Refer to figure 9-16 and remove the throttle control linkage as follows:

- (1) Remove handle (1) from hand throttle lever
- (7). Remove throttle lever assembly by removing

(2) Disassemble throttle removing nut (4), washers (5 and 6), and washer (8). Remove data plate screws (66).

- 1 Throttle handle
- 2 Screw
- 3 Lock nut
- 4 Lock nut
- 5 Washer
- 6 Washer
- 7 Throttle lever
- 8 Washer
- 9 Screw
- 10 Lockwasher
- 11 Control bracket
- 12 Control link
- 13 Nut
- 14 Rod
- 15 Cotter pin
- 16 Straight pin
- 17 Clevis
- 18 Spring
- 19 Cotter pin
- 20 Straight pin
- 21 Rod linkage
- 22 Cotter pin
- 23 Straight pin
- 24 Spring pin
- 25 Throttle lever
- 26 Throttle lever
- 27 Screw



- and remove pin from clevis (44).
- (6) Remove spring (18). Remove cotter pins straight pins (20) and rods (21).
- (7) Remove cotter pin (22) and straight pin (23) throttle lever (25). Tap spring pin (24) out remove throttle lever (25) from support (29).
- (8) Pull throttle lever (26) from support (29) remove support by removing screws (27) and washers (28).
- (9) Unscrew clevis (30) from cable (41). Remove washers (31), lockwashers (32) and lift bracket (33) alternator guard (34) from the carrier.
- (10) Remove cable (41) and disassemble if necessary by removing clevis (44) and nuts (40).
- (11) Remove cotter pins (42) and straight pins from the ends of rod (45). Remove clevis (44) nut (46) from the rod.
- (12) Remove cotter pin (47) and pin (48) and pedal (49) off pedal bracket (53).
- (13) Remove screws (50), lockwashers (51) and washers (52) and remove pedal bracket (53).
- (14) Remove nut (56), lockwasher (55), screw and pedal stop (57).
- (15) Remove nuts (64), lockwashers (63), washers (62), spacers (59, 60 and 61) and screws from bellcrank (65).

Cleaning, Inspection and Repair.

- (1) Clean all metallic parts of the control linkage with cleaning solvent (Fed. Spec. P-D-680 or equivalent) and dry thoroughly.
- (2) Inspect all parts for cracks, breaks, wear or other damage.
- (3) Repair or replace all parts found to be defective.

Installation. Refer to figure 9-16 and install throttle controls and linkage as follows:

- (1) Install bellcrank (65) using screws (58), washers (59, 60 and 61), washers (62), lockwashers and nuts (64).
- (2) Install pedal stop (57) by placing screw (54) through stop and securing with lockwasher (55) and nut (56).
- (3) Install pedal bracket (53) using screws (50), washers (51) and nuts (52).
- (4) Place pedal (49) on bracket (53) and slide straight pin (48) through holes provided on the bracket and pedal. Secure pin (48) with cotter pin

Screw clevis (30) to cable (41).

- (7) Install alternator guard (34) and bolt (33). Secure with lockwashers (32) and screws (27).

(8) Install support (29) using lockwashers and screws (27). Slide throttle lever (26) through support (29) as illustrated.

- (9) Slide throttle lever (25) onto lever (26) and secure with spring pin (24). Connect throttle lever (25) to clevis (30) with straight pin (23) and cotter pin (22).

(10) Connect rods (21) to throttle lever (25) using straight pin (20) and cotter pin (19). Connect the other end of rods (21) to control using straight pin (20) and cotter pin (19). Connect spring pin (24) to rods (21).

- (11) Assemble nuts (30), clevis (17) and control link (12) to rod (14). Connect clevis (17) to bellcrank (65) using straight pin (16) and cotter pin (15).

(12) Install control bracket (11) using lockwashers (10) and screws (9). Install data plate (67) on bracket with screws (66).

- (13) Assemble throttle lever assembly to control bracket by installing washer (8), throttle lever (7), washers (6), and washer (5) and securing with nut (4).

(14) Assemble control link (12) to throttle lever (7) using screw (2) and lock nut (3).

- (15) Assemble handle (1) to hand throttle lever (7).

d. Adjustment. Adjust the throttle controls in the following order.

- (1) Adjust the bellcrank (65, fig. 9-16) to the controller by rotating clevis (30) on control link (41).

NOTE

Upon completion of adjustments, clevis (30) and clevis (44) should be locked in place with nuts (40).

- (2) Adjust pedal (49) to bellcrank (65) by moving rod (45) from pedal and rotating clevis (44) for proper adjustment. Lock rod in position with nut (46) and reassemble rod to pedal bracket when adjustment is complete.

(3) Adjust the hand throttle lever to bellcrank by adjusting control link (12) and clevis (17) on rod (14). After adjustment lock clevis (17) on rod (14) with nut (13). Connect control link in position on rod with nuts (13).

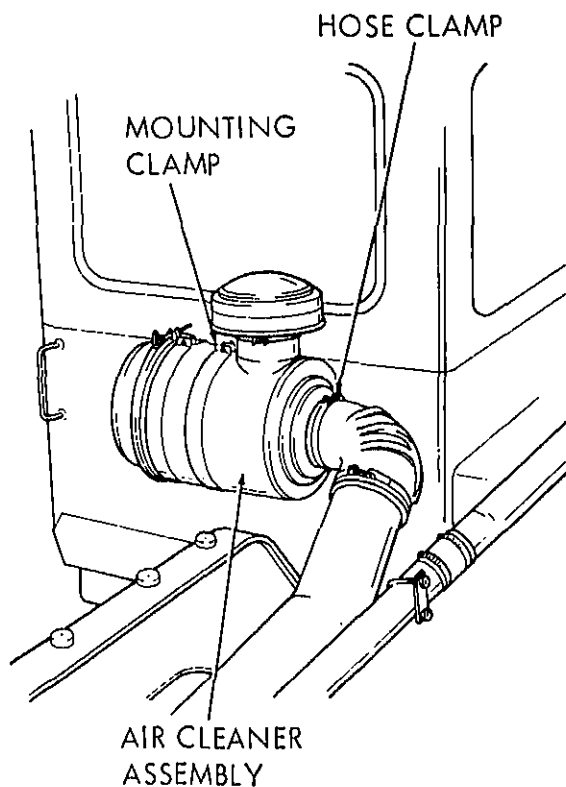


Figure 9-17. Air cleaner, removal and installation.

(1) Loosen screw on hose clamp and slide clamp and tube elbow off the air cleaner.

(2) Remove screw and nut on mounting clamp. Spread band and remove air cleaner assembly.

b. Disassembly. Refer to figure 9-18 and disassemble the air cleaner assembly and hoses as follows.

(1) Remove nut (5), lockwasher (4) and screw (3) and remove bracket (6).

(2) Loosen hose clamps (1) and remove tube coupling (2), air duct (7), and tube elbow (8). Remove clamps (1).

(3) Remove screws (9), lock washers (10) and nuts (11) and remove clamp (12) from carrier.

(4) Remove cap (13) from cleaner body (20).

(5) Remove baffle clamp (14) and separate cup (17) from body (20). Remove preformed packing (15) and disassemble cup and baffle assembly.

a solution of (Donaldson D-1400 water. Rinse thoroughly with clear (maximum water pressure) completely.

(3) Inspect element by placing it inside element and check for damaged gaskets while rotating slowly. Replace element if any or if element has not been replaced every 12 months.

(4) Inspect all parts of the air cleaner for cracks, breaks, dents or other damage. Replace hoses for deterioration.

(5) Replace all defective parts. Replace preformed packing showing signs of deterioration.

d. Reassembly. Refer to figure 9-18 and reassemble the air cleaner system as follows.

(1) Install element (19) into cleaner body (20). Secure with thumbscrew (18).

(2) Assemble baffle (16) to cleaner body (20). Secure with provided wing nut.

(3) Install new preformed packing (15) in cup and baffle assembly (20). Secure with baffle clamp (14).

(4) Install cup (13) to cleaner body (20).

(5) Install clamp (12) to carrier.

(9), lockwashers (10) and nuts (11) to bracket (6).

(6) Place clamps (1) on tube coupling (2), air duct (7), and tube elbow (8). Install air duct (7), and tube elbow (8) and tube coupling (2).

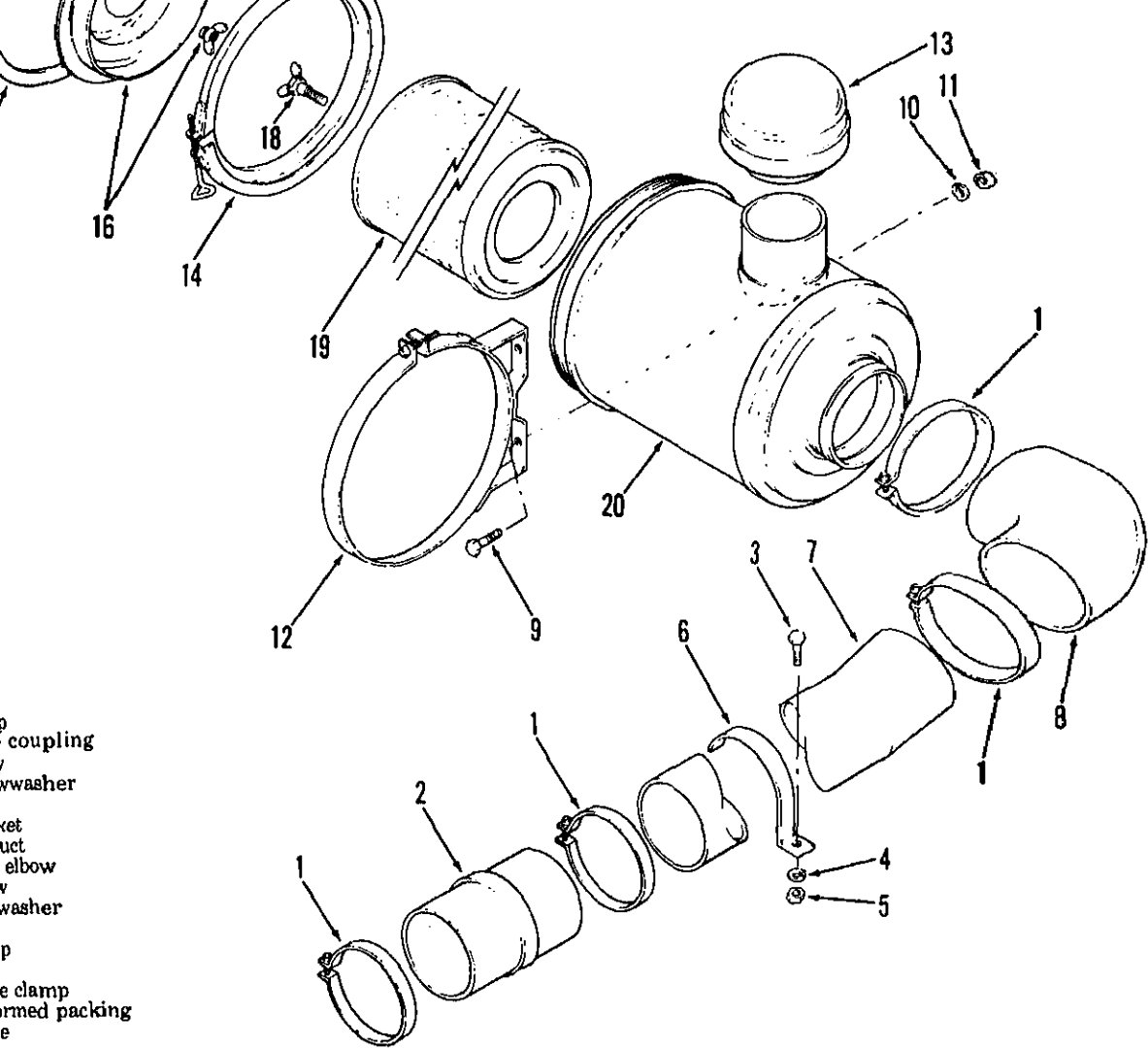
(7) Install bracket (6) to carrier. Secure with lockwasher (4) and nut (5).

e. Installation. Refer to figure 9-17 and install the air cleaner as follows:

(1) Place air cleaner assembly (20) on carrier. Secure with band screw (12).

(2) Place tube elbow on air duct (7). Secure with hose clamps.

f. Service. Service of the air cleaner should be inspected and cleaned. Any damage that may allow air to enter the engine without first passing through the air cleaner must be corrected. Any damage must be corrected. Remove, inspect and replace air cleaner element.



p coupling
 / washer
 ret
 uct
 elbow
 v
 washer
 p
 e clamp
 rmed packing
 e
 mbscrew
 gent

(TA033078)

Figure 9-18: Air cleaner system, exploded view.

ect element, gasket and preformed
 described in paragraph 9-32c.
 ill a new element on one that has
 . Insure that element seats properly
 the air cleaner outlet end.
 mble baffle (16) to dust cup (17) and
 ying nut.

making sure it seats properly to prevent unf
 tered air leakage. Tighten clamp (14).

CAUTION

Never operate the engine without an
 element in the air cleaner. Do not use a
 damaged element, a hole in the cleaner
 element will eliminate the effectiveness

rapidly and then controls the temperature by circulating coolant through the engine water passages. The cooling system consists of the following: Water pump to circulate the coolant; Radiator to cool the circulating coolant; Thermostat to control the volume of coolant to be circulated through the engine to maintain the operating temperature; Filter to neutralize acidity of the water; Fan, lines and tubing as needed to complete the cooling circuit.

9-34. Thermostat, Thermostat Housing

a. Removal.

(1) Refer to paragraph 8-11b and drain cooling system.

(2) Remove deck plates over engine.

(3) Remove thermostats and thermostat housings as illustrated in figure 9-19.

b. Cleaning. Clean all metallic parts of the thermostat and thermostat housing and related parts with cleaning solvent (Fed. Spec. P-D-680 or equivalent) and dry thoroughly.

c. Inspection.

(1) Inspect all parts for cracks, breaks or other damage.

(2) Inspect all hose for deterioration or other damage.

(3) Inspect all hardware for damage or thread wear.

d. Thermostat Test. Test proper operation of the thermostat in the following method.

(1) Suspend the thermostat and a thermometer in a container of water.

(2) Heat the water while monitoring the thermometer. When the thermometer reads 165°F, the thermostat should start opening. At 180°F, the thermostat should be completely open.

(3) Remove thermostat from hot water and check that it closes while cooling. When thermostat has cooled it should be completely closed.

e. Replacement. Replace all parts found to be damaged or defective. Replace all gaskets when removed.

f. Installation. Install the thermostats and thermostat housings as illustrated in figure 9-19.

9-35. Coolant Hoses, Fittings and Filter

b. Cleaning and Inspection.

(1) Clean all metallic fittings with cleaning solvent (Fed. Spec. P-D-680 or equivalent) and dry thoroughly.

(2) Inspect all parts for cracks, breaks or other damage. Check all hoses for deterioration and replace all defective parts.

c. Installation.

(1) Install a new water filter.

(2) Refer to figure 9-20 and install hoses and fittings as illustrated.

(3) Refer to paragraph 8-11b and install cooling system.

9-36. Fan Assembly

a. Removal.

(1) Refer to figure 9-21 and remove the hydraulic hoses.

(2) Remove guard by removing hardware.

(3) Remove fan assembly by removing hardware.

(4) Refer to figure 9-22 and remove moving (6) bolts, nuts and lockwashers.

b. Clean and Inspection.

(1) Clean all metallic parts with cleaning solvent (Fed. Spec. P-D-680 or equivalent) and dry thoroughly.

(2) Inspect all parts for cracks, breaks or other damage. Replace fan or parts as required. Report any other damage to general support maintenance personnel.

c. Installation.

(1) Refer to figure 9-22 and install fan assembly with (6) bolts, nuts and lockwashers.

(2) Refer to figure 9-21 and install guard to carrier. Secure with attaching hardware.

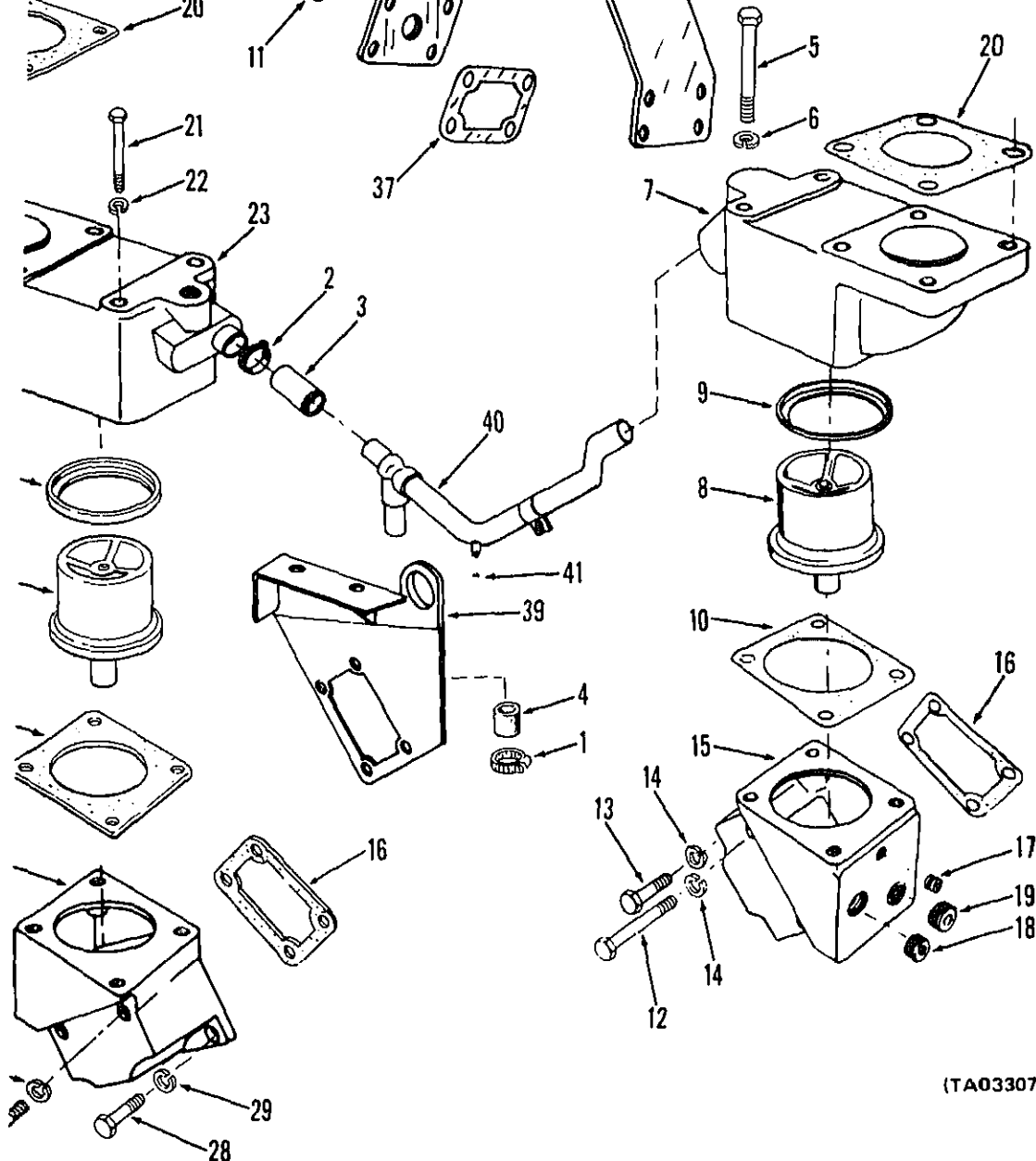
(3) Install for guard and secure with hardware.

(4) Uncap and reconnect hoses disconnected in removal.

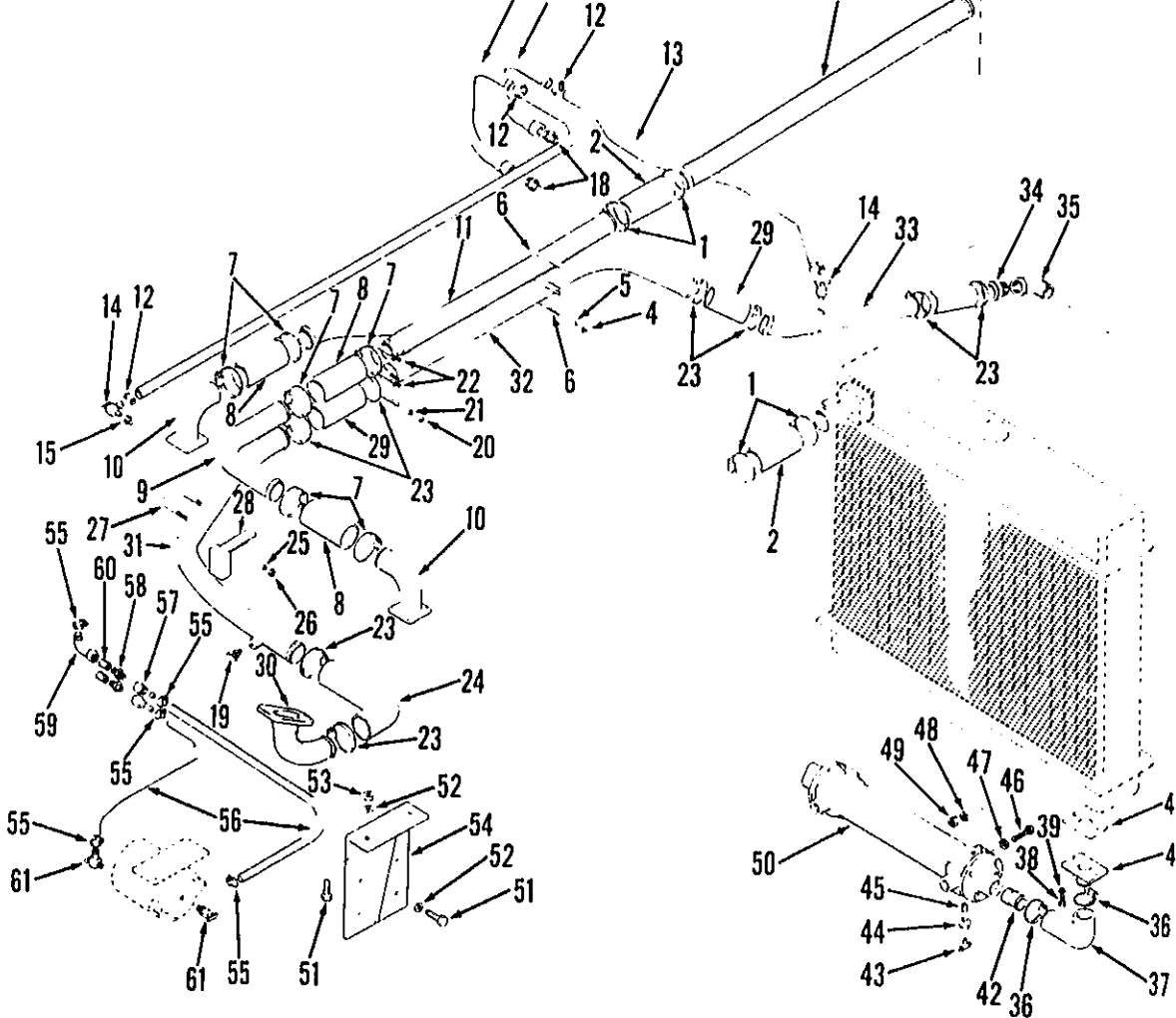
9-37. Water Pump and Alternator

a. Removal.

(1) Remove engine deck



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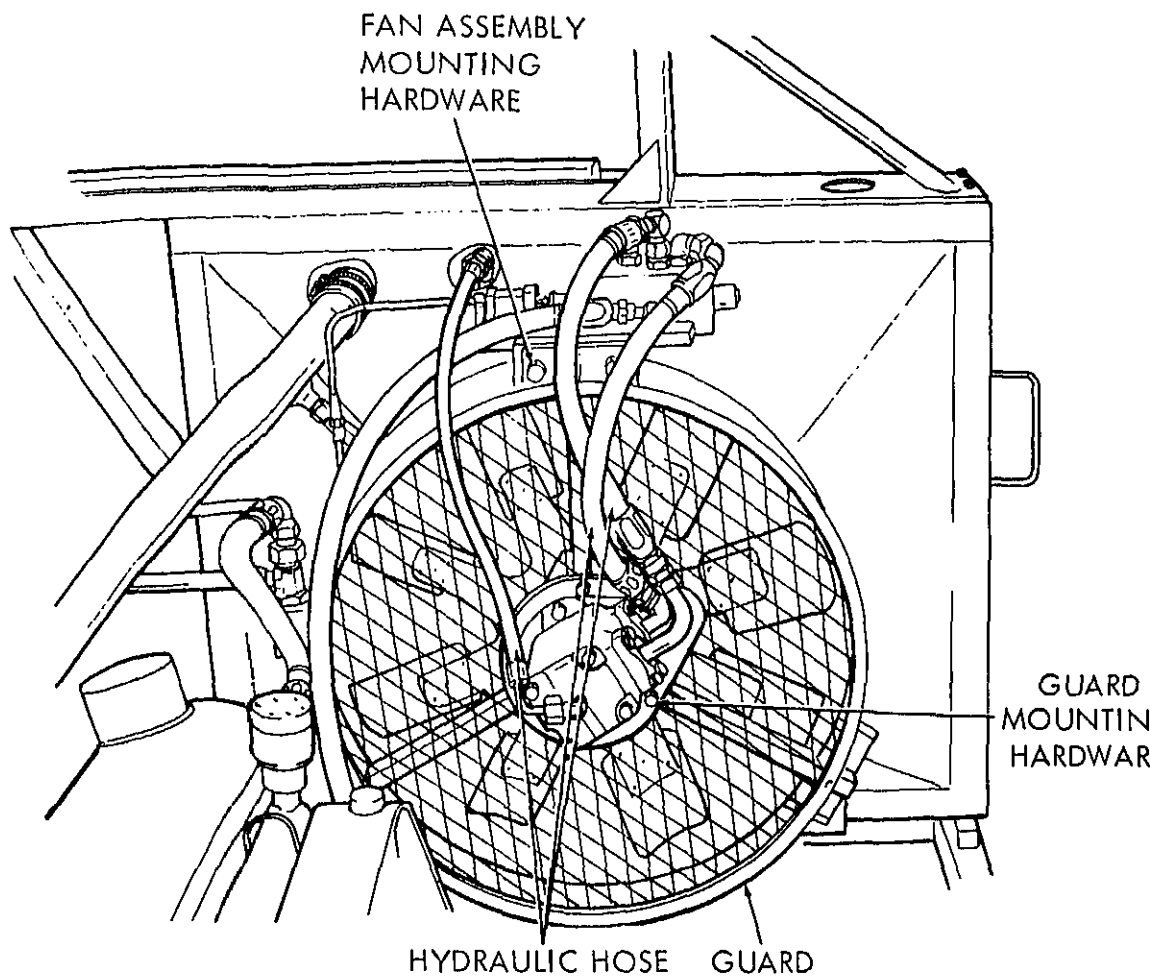


(TA0330)

- 1 Clamp
- 2 Hose
- 3 Tube
- 4 Nut
- 6 Lockwasher
- 6 U-bolt
- 7 Clamp
- 8 Hose
- 9 Tube
- 10 Flange
- 11 Tube
- 12 Clamp
- 13 Hose
- 14 Drain cock
- 15 Bushing
- 16 Tube
- 17 Tube

- 22 U-bolt
- 23 Clamp
- 24 Hose
- 25 Nut
- 26 Lockwasher
- 27 U-bolt
- 28 Bracket
- 29 Hose
- 30 Inlet
- 31 Tube
- 32 Tube
- 33 Tube
- 34 Adapter
- 36 Elbow
- 36 Clamp
- 37 Hose
- 38 Screw

- 43 Drain cock
- 44 Coupling
- 45 Nipple
- 46 Screw
- 47 Washer
- 48 Lockwasher
- 49 Nut
- 50 Exchanger
- 51 Screw
- 52 Lockwasher
- 53 Nut
- 54 Bracket
- 55 Clamp
- 56 Hose
- 57 Hose end
- 58 Adapter



(TA03

Figure 9-21. Fan assembly, removal and installation.

(2) Refer to figure 9-23 and loosen alternator mounting screws.

(3) Loosen tension adjustment screw and release alternator drive belt tension.

(4) Remove the two drive belts

(1) Refer to figure 9-23 and install drive belts as illustrated.

(2) Adjust drive belts by lifting on a to increase belt tension. When belts have of inch deflection per foot of span when

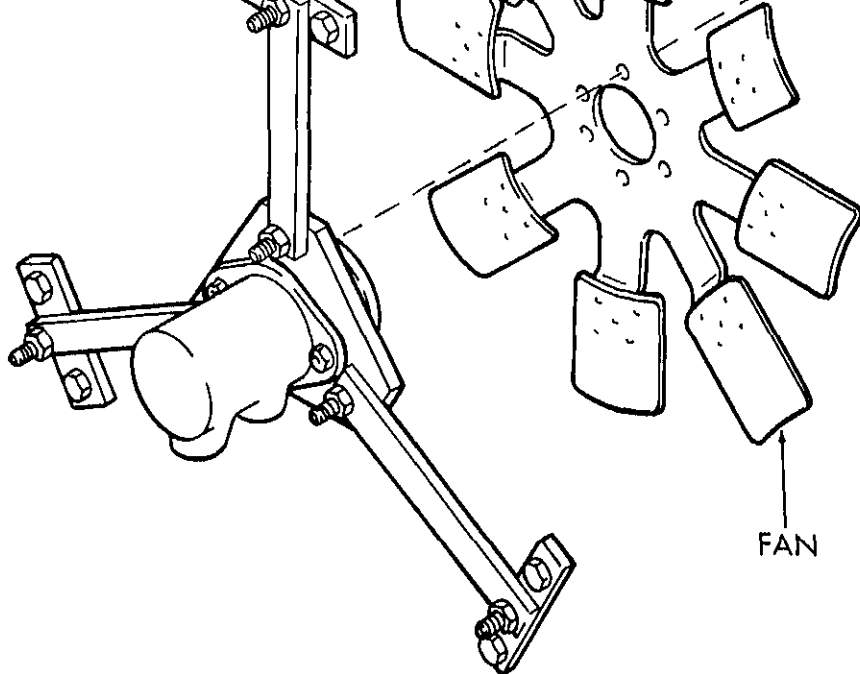


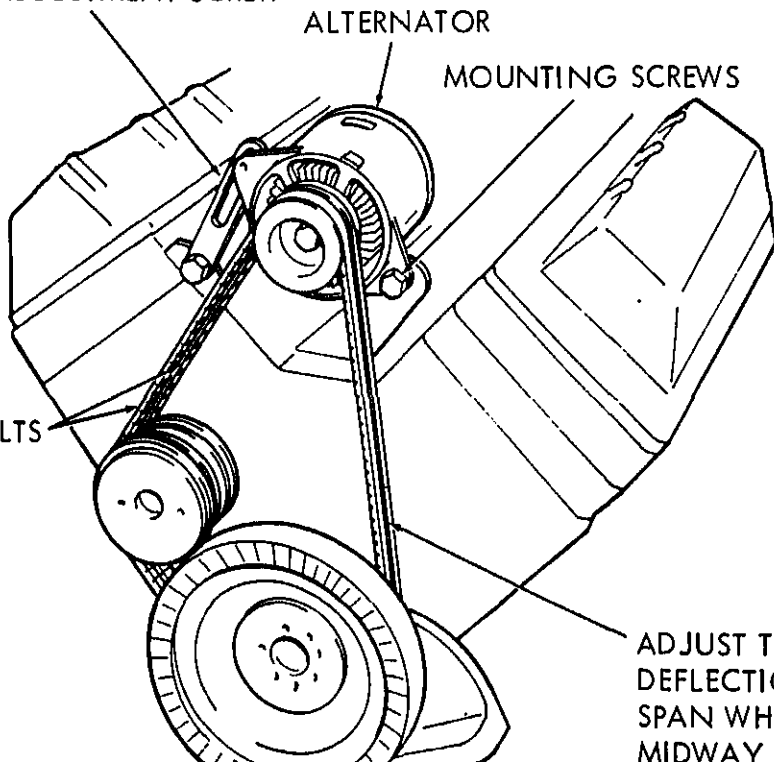
Figure 9-22. Fan, removal and installation.

TENSION ADJUSTMENT SCREW

ALTERNATOR

MOUNTING SCREWS

DRIVE BELTS



ADJUST TO 1/4 TO 1/2 IN.
DEFLECTION PER FOOT OF
SPAN WHEN DEPRESSED
MIDWAY BETWEEN PULLEY

... batteries, an al-
ator, regulator, starter and solenoid, lighting
em, panel switch and gages, and connecting
s and cables.

CAUTION

Ground cable must be removed from bat-
tery before servicing or removing any
electrical component.

Batteries, Cables and Battery Box

Service and Testing.

(1) Remove battery box cover (Fig. 9-24).

(2) Using sulfuric acid of 1.280 ± 0.005 specific
gravity at 77°F ., fill each cell to three-eighths of an
above plates.

NOTE

Battery and acid should be at a temper-

electrolyte specific gravity of each cell. Co
readings to 77°F ., by using TM9-6140-200-12.

(4) Unless one of the following conditions
the battery is ready for use.

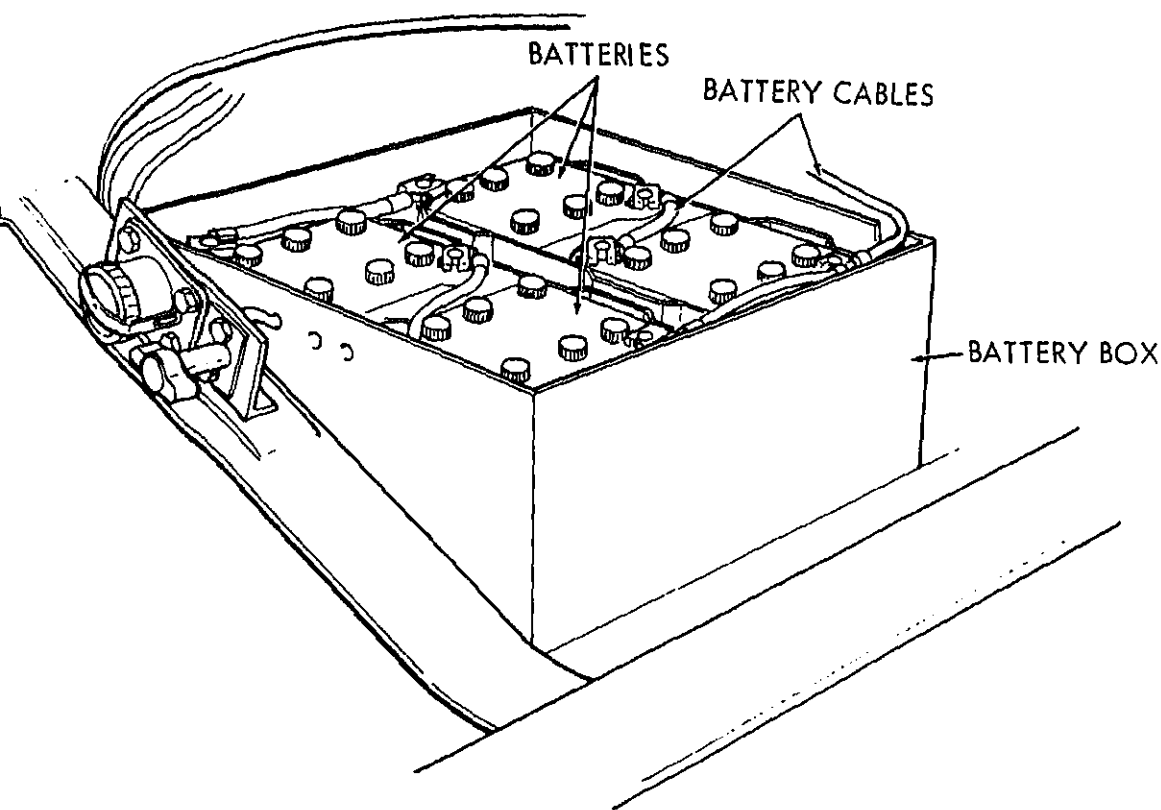
(a) The specific gravity is below 1.250.

(b) The battery will not be used withi
hours of filling.

(c) The battery is to be used in tempera
below 0°F .

(5) If any of the above conditions exist
battery should be charged until the specific g
gravity becomes constant after three consecutive
minute readings. Battery electrolyte shall the
adjusted to 1.280 ± 0.010 .

b. *Removal.* Refer to figure 9-24 and remove
bles, battery and battery box as illustrated.



(TA033084)

Figure 9-24. Battery, cables and battery box, removal and installation.

d. *Installation.* Install battery, cables and battery box and cover as illustrated on figure 9-24.

0. Alternator Assembly

Testing on Vehicle.

- (1) Remove engine deck plates (para 8-20).
- (2) Remove the alternator terminal cover, and check the voltage between the exposed positive output terminal and ground. Full battery voltage should be indicated.

NOTE

When taking this voltage reading, the battery disconnect switch shall be in the "ON" position.

- (3) If the fuel battery voltage is not present, open between the battery and positive output terminal of the alternator is indicated. This may be due to a loose or broken wiring or possible a defective circuit breaker, master switch or ammeter.
- (4) Place the main switch to the "ON" position and check for full battery voltage between the alternator ignition lead and ground.

NOTE

Prior to continuing with testing any defects must be corrected. Full battery voltage must be present at both the positive output terminal and the ignition lead when the battery disconnect and the main switch are in the "ON" position.

CAUTION

Never start the carrier engine when the alternators positive output terminal is open and its ignition lead is energized. Externally high voltage will be created which will damage the alternator.

- (5) Connect voltmeter across positive and negative terminals of the battery.
- (6) Start the carrier engine and idle at 1000 RPM. Reading on voltmeter should be 28.0 volts without electrical accessories turned on. If voltage reading is not proper, adjust alternator as described in paragraph 9-40b.

Alternator Adjust.

- (1) From drive end of alternator remove the set head nine plug.

the voltage setting to prevent the battery from overheating. Under these conditions settings should be reduced to a point where the batteries remain charged but do not overheat or use excessive amount of water.

- c. *Removal.* Refer to figure 9-25 and remove alternator and drive belt as illustrated.

d. Cleaning and Inspection.

- (1) Using a clean damp cloth wipe the alternator exterior.
- (2) Inspect all electrical wiring for worn or frayed insulation which could result in short circuit. Check terminals and wires for corrosion, wear and looseness. Clean and tighten all terminal connections.

e. Replacement.

- (1) Replace alternator if defective.
- (2) Replace alternator drive belt if cracked, frayed or shows signs of wear.

- f. *Installation.* Refer to figure 9-25 and install alternator and drive belt as illustrated.

9-41. Starting Motor

a. Testing on Vehicle.

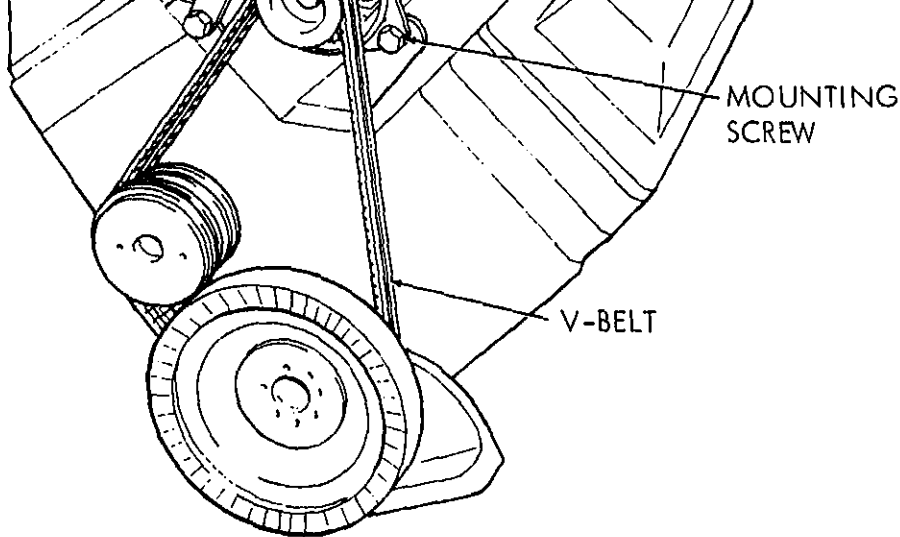
- (1) Check the batteries as described in paragraph 9-39 to insure they are in good condition.
- (2) Check all motor wiring for broken or defective wiring. Inspect for frayed insulation. Replace defective wiring.
- (3) Using a voltmeter adjusted for DC operation, check voltage on the starting motor battery terminal. If voltage is 22-24 volts and starter does not operate, replace starter. If there is no voltage at the starter, place a jumper around any switch or solenoid that may be defective until open circuit is indicated.

NOTE

Battery disconnect switch must be in the "ON" position when checking the voltage at the starting motor battery terminal.

b. Removal.

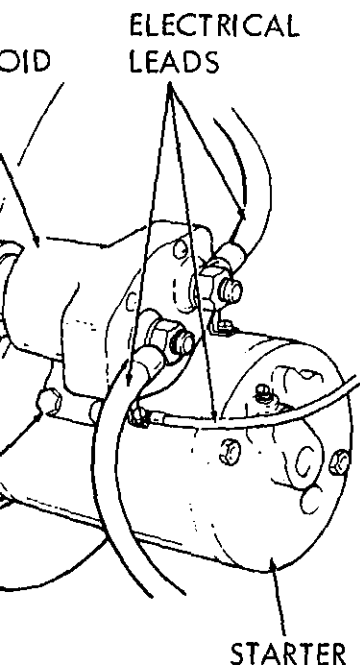
- (1) Remove right hand exhaust pipe as described in paragraph 9-19.
- (2) Tag and disconnect all electrical leads to the starter and solenoid.



MOVE ENGINE DECK PLATES TO GAIN ACCESS TO ENGINE COMPARTMENT.
 AND DISCONNECT ELECTRICAL LEADS.
 LOOSEN MOUNTING SCREWS AND TENSION ADJUSTMENT SCREW AND
 MOVE V-BELTS.
 MOVE MOUNTING AND TENSION ADJUSTMENT SCREWS AND LIFT
 ALTERNATOR FROM ENGINE.

(TA033085)

Figure 9-25. Alternator, removal and installation.



c. Cleaning and Inspection.

- (1) Using a clean damp cloth, wipe the starter and solenoid exterior.
- (2) Check solenoid relay for damage or defects.
- (3) Inspect wiring for broken strands and/or frayed insulation.
- (4) Check that the armature turns freely without bending by rotating the starter drive pinion.
- (5) Check starter commutator for pits, burns, or other damage.
- (6) Inspect starter brushes for excessive wear.

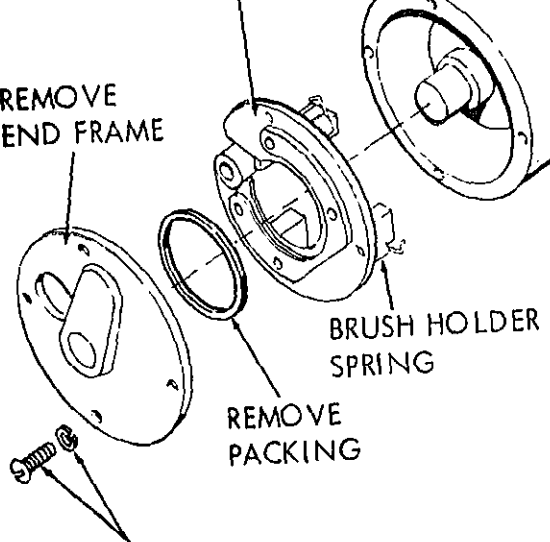
d. Replacement.

- (1) Replace all wires found to be defective.
- (2) Replace a defective solenoid. Remove solenoid by removing mounting hardware and lifting solenoid from starter.
- (3) Replace starter brushes if worn excessively (see fig. 9-27).

NOTE

Brushes are mounted on plate assembly

REMOVE
END FRAME



BRUSH HOLDER
SPRING

REMOVE
PACKING

REMOVE SCREWS
AND WASHERS

(TA033087)

Figure 9-27. Starter brush, replacement.

tagged during removal.
(3) Install right hand ex-
scribed in paragraph 9-19.

9-42. Control Panel, Switch Lights

a. Removal. Refer to figure
switches, gages and lights as nece

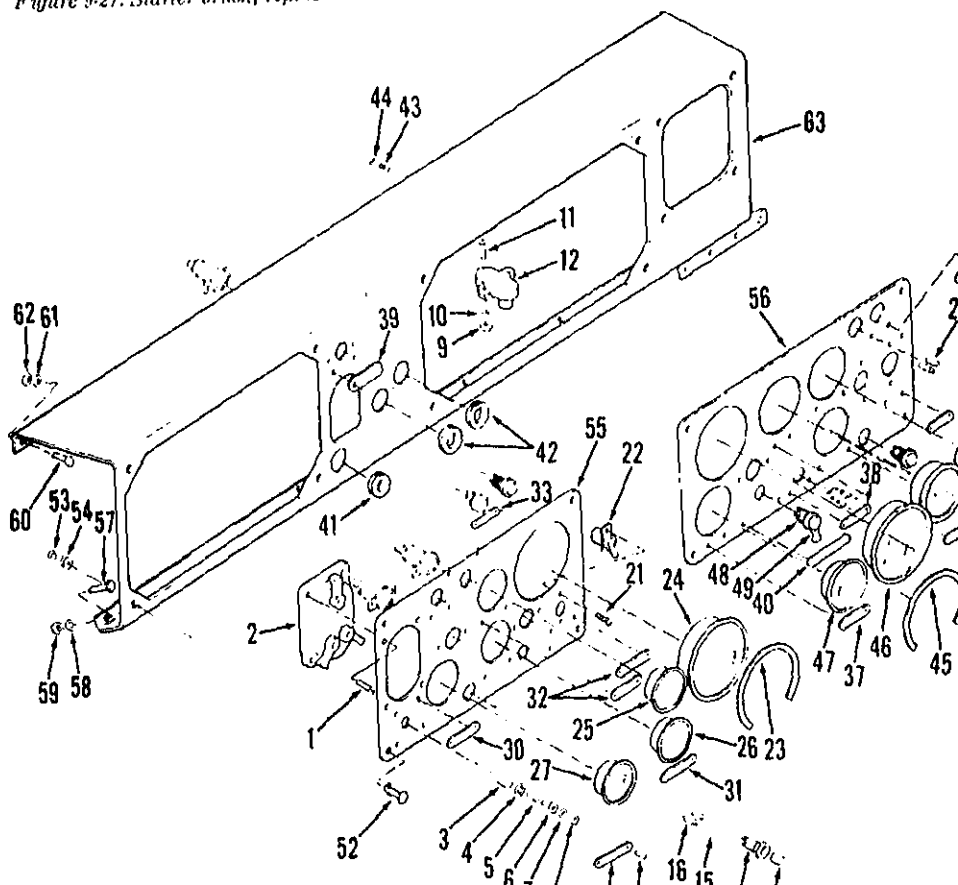
b. Cleaning and Inspection.

(1) Clean all parts and dry th

(2) Inspect all parts and com
or damage.

(3) Inspect cables for frayed
wires, bent or broken terminals.
Repair or replace defective wiring

c. Installation. Refer to figur
switches, gages and lights.



in signal as illustrated.

b. *Installation.* Install turn signal as illustrated figure 9-29.

44. Engine Temperature and Warning Light Sending Units

a. *Removal.* Refer to figure 9-30 and remove the temperature thermostat and warning light sending units.

STEP 2. REMOVE MOUNTING SCREW

STEP 3. REMOVE TURN SIGNAL SWITCH

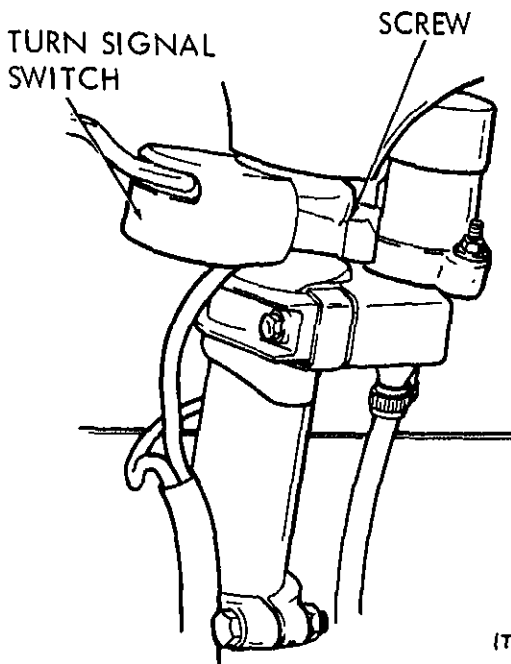
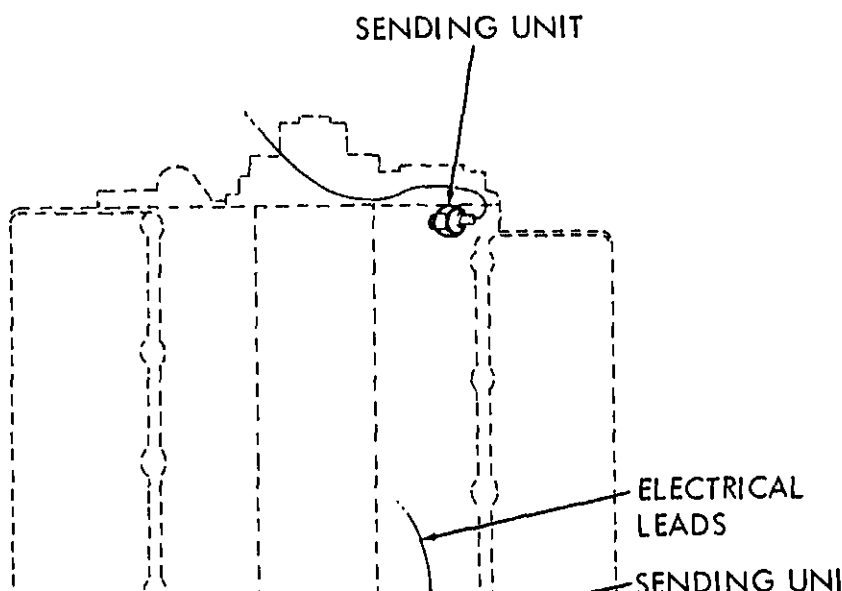


Figure 9-29. Turn signal switch, removal and installation.

STEP 1. DISCONNECT ALL HYDRAULIC LINES. CAP IMMEDIATELY.

STEP 2. DISCONNECT ALL ELECTRICAL LEADS.

STEP 3. REMOVE SENDING UNITS.



c. *Installation.* Refer to figure 9-30 and install temperature thermostat and sending unit as illustrated.

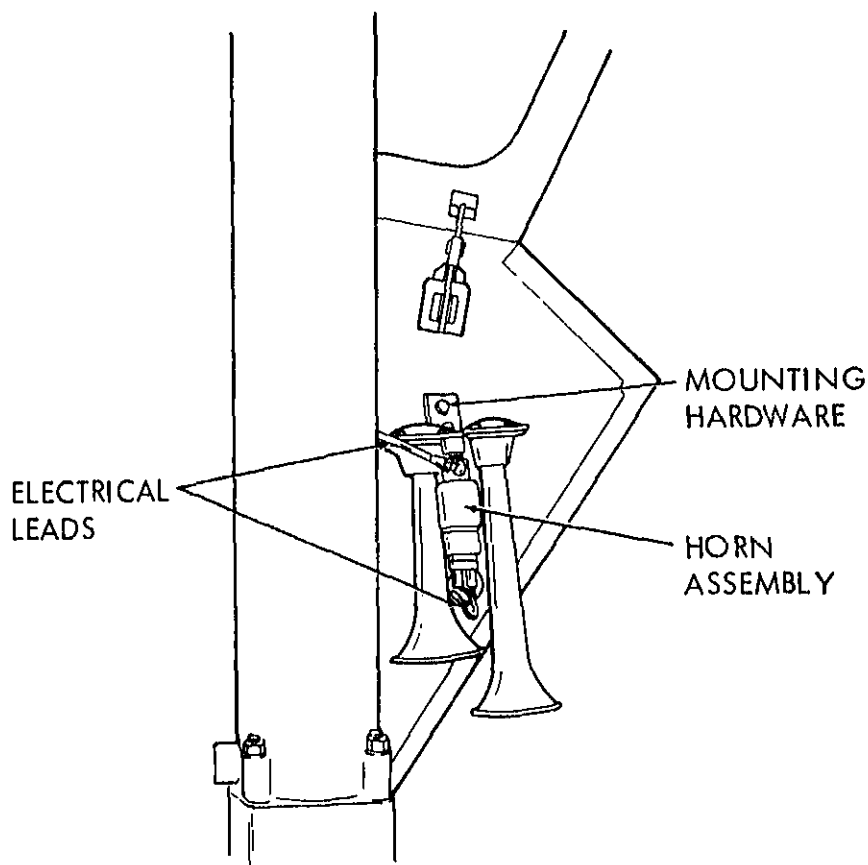
9-45. Horn and Horn Button

a. *Testing.* Depress horn button and see that the

(1) Remove horn assembly as shown in figure 9-31.

(2) Remove horn button assembly.

(a) Push horn button (2, figure 9-31) to release. Lift button (2) from steering wheel.



STEP 1. TAG AND DISCONNECT ALL ELECTRICAL LEADS TO THE HORN ASSEMBLY.

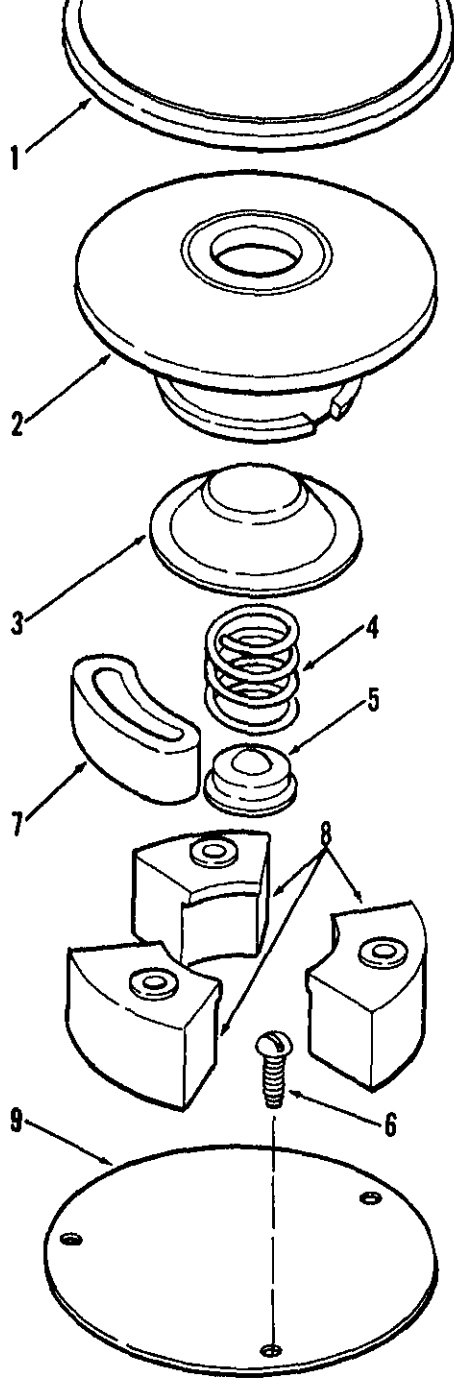
STEP 2. REMOVE MOUNTING HARDWARE AND LIFT HORN FROM CARRIER CAB ASSEMBLY.

Figure 9-31. Horn assembly, removal and installation.

(b) Remove contact cup (3), spring (4) and base (5). Lift off contact insulators (7) and horn contact (8).

(Fed. Spec., P-D-680, or equivalent) thoroughly.

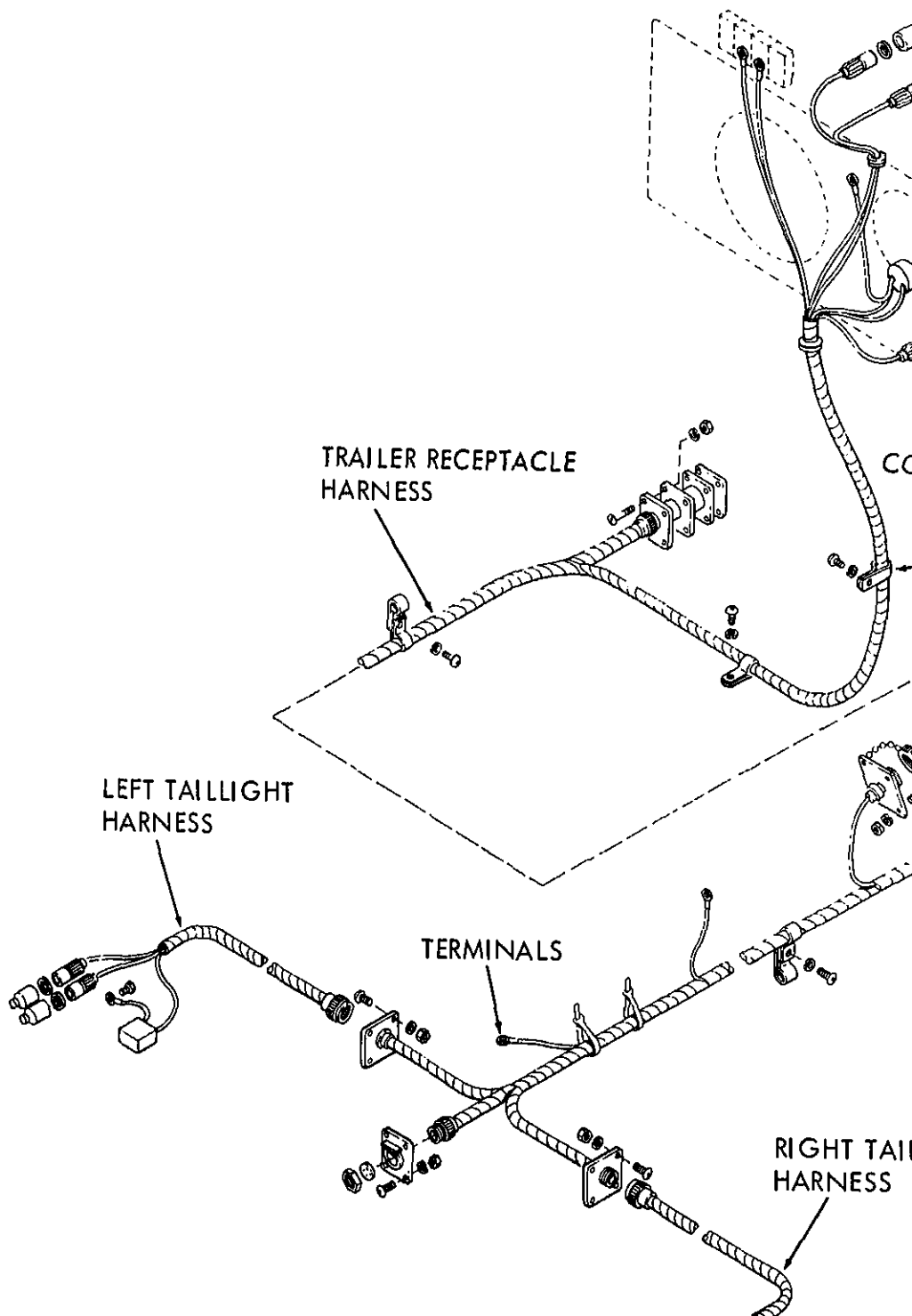
(2) Inspect horn assembly and

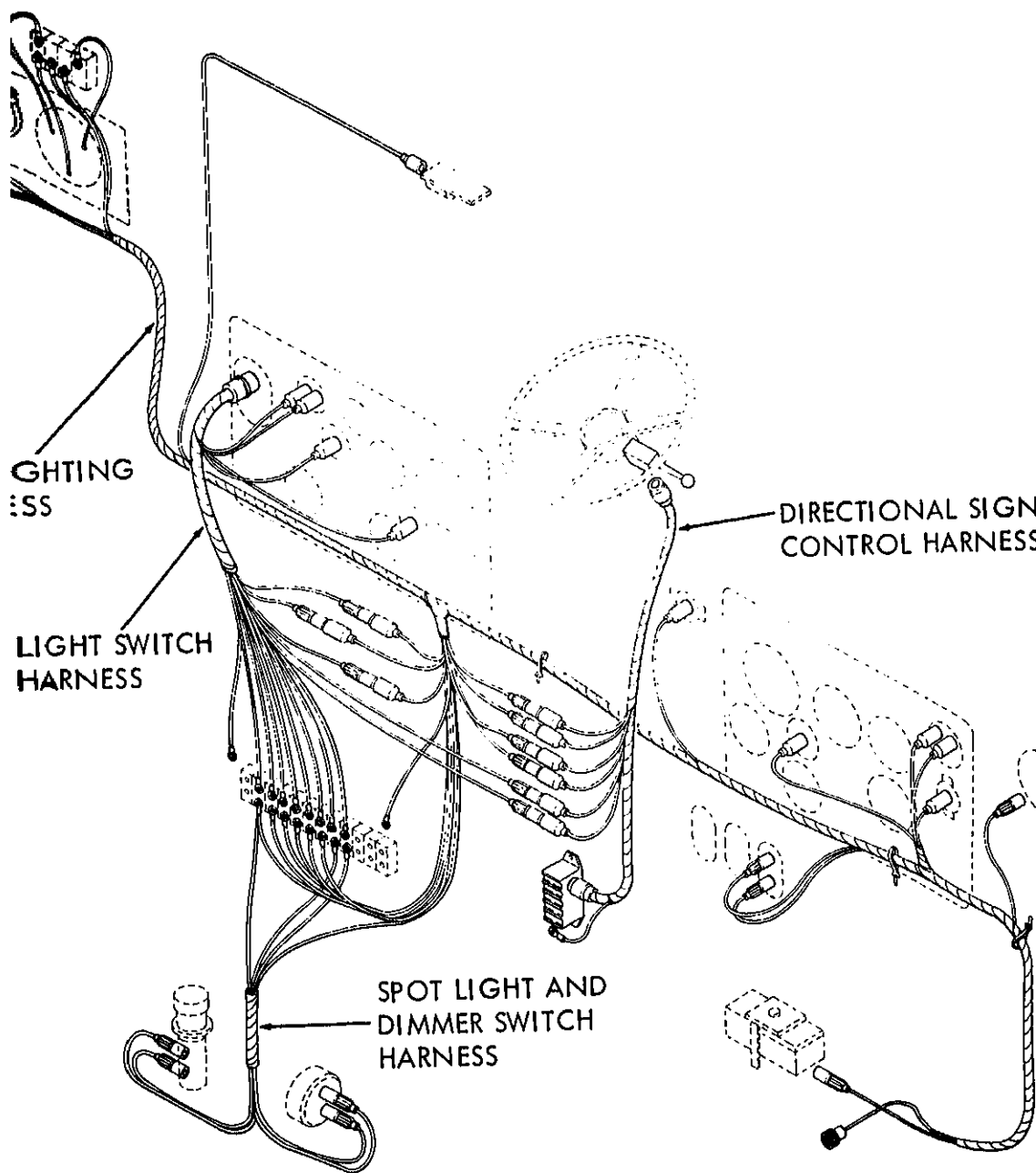


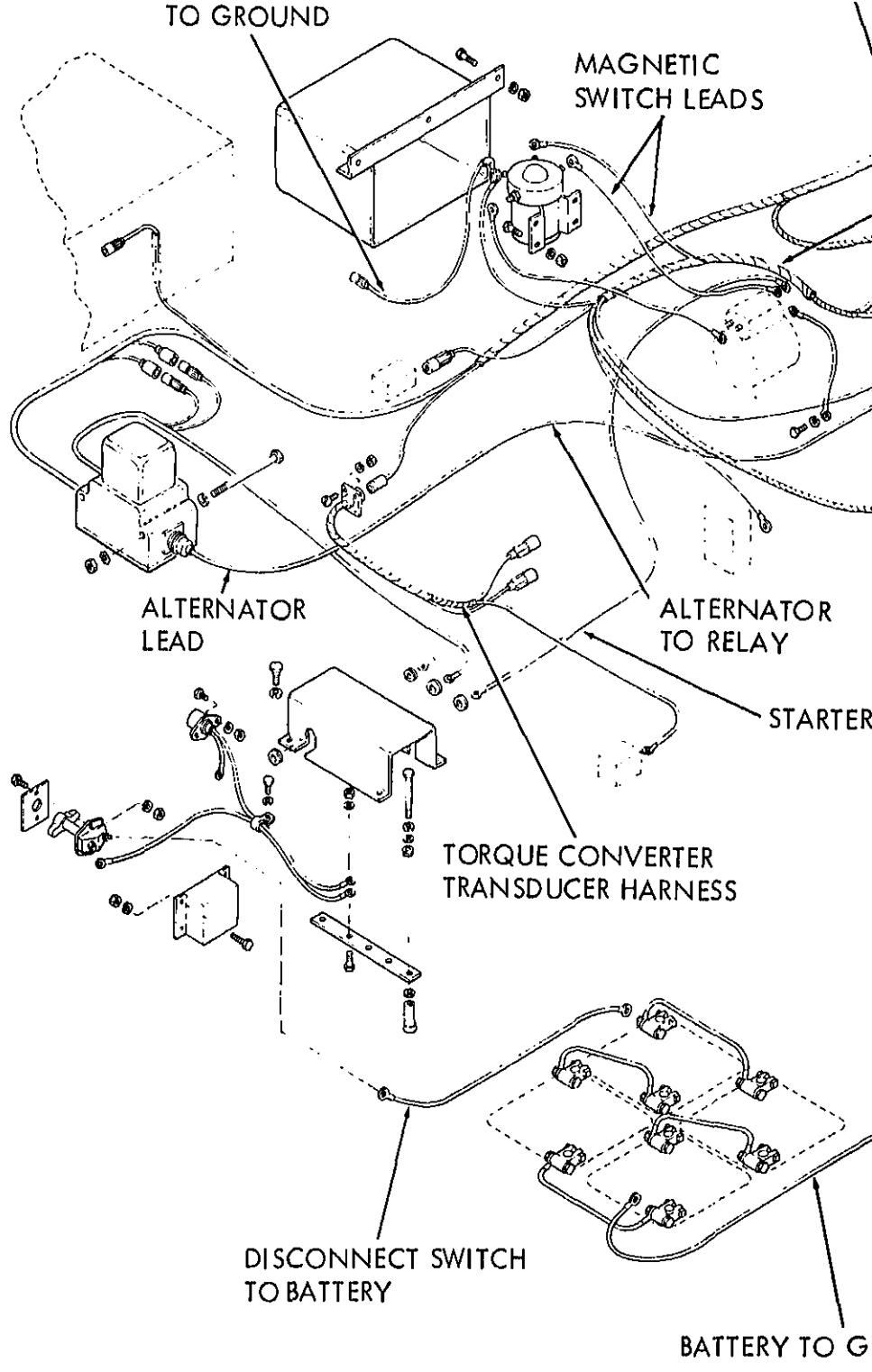
- 1 Cover
- 2 Horn button
- 3 Contact cup
- 4 Spring
- 5 Spring base
- 6 Screw
- 7 Contact insulator
- 8 Horn contact
- 9 Contact plate

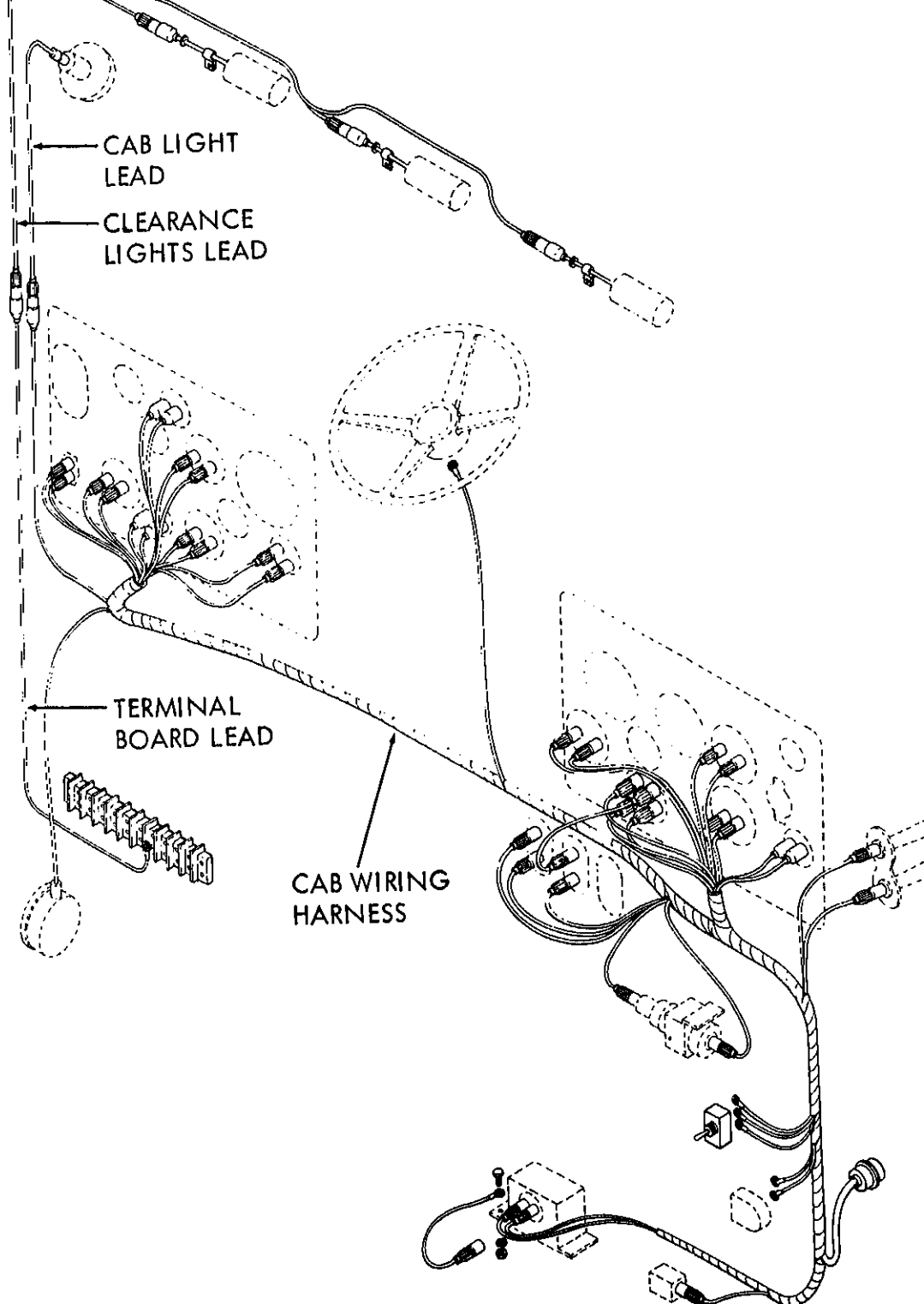
Figure 9-32. Horn button assembly, removal and installation.

(1) Disconnect all harness or leads connectors.









47. Transmission and Torque Converter

a. Transmission Service.

(1) Refer to figure 9-34 and check level of transmission fluid.

NOTE

Engine must be running at an idle speed of 500-600 rpm to accurately check transmission fluid level.

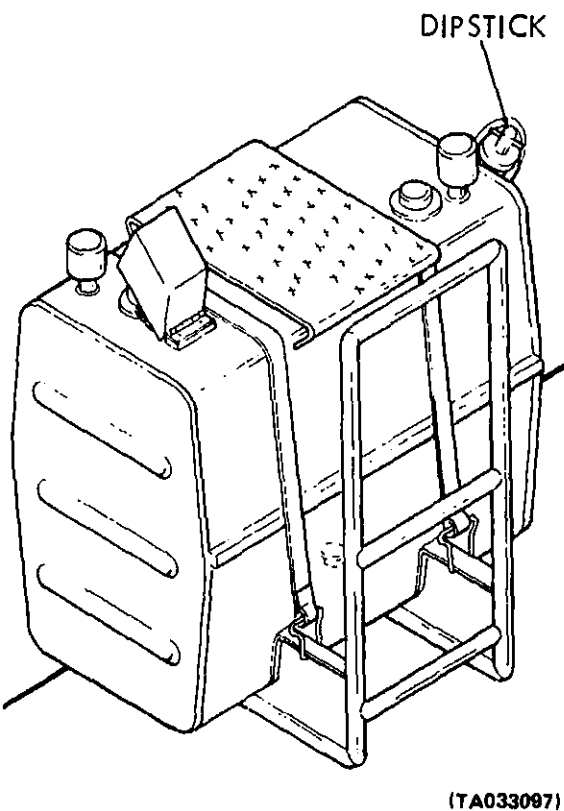


Figure 9-34. Transmission dipstick.

(2) to LO5-3810-295-12 and add fluid as necessary to bring level to "full" mark on transmission dipstick.

(3) If transmission shows signs of leaking or an excessive amount of fluid is being used report condition to general support maintenance.

b. Transmission Inspection.

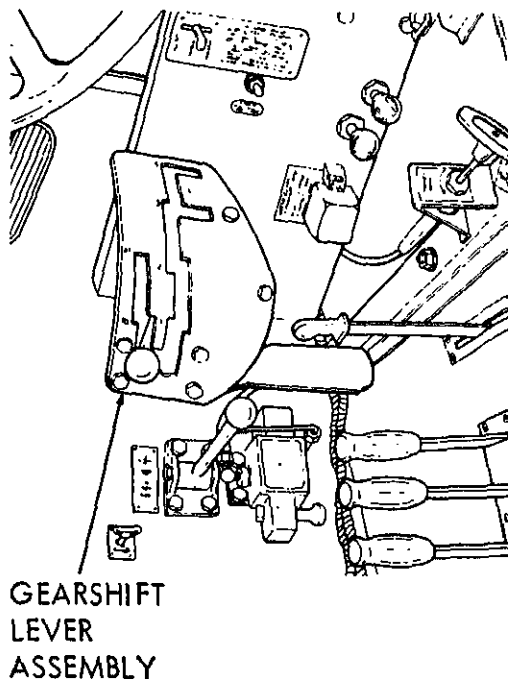


Figure 9-35. Gearshift lever assembly.

(2) Inspect the hydraulic shift control linkage for cracks, breaks or other damage for loose or missing hardware. Report all to direct support maintenance for repair or replacement.

c. Torque Converter Filter Service. Refer to figure 9-36 and replace the filter element as follows:

(1) Remove drain plug (1) from element housing (3) and drain fluid in a suitable container.

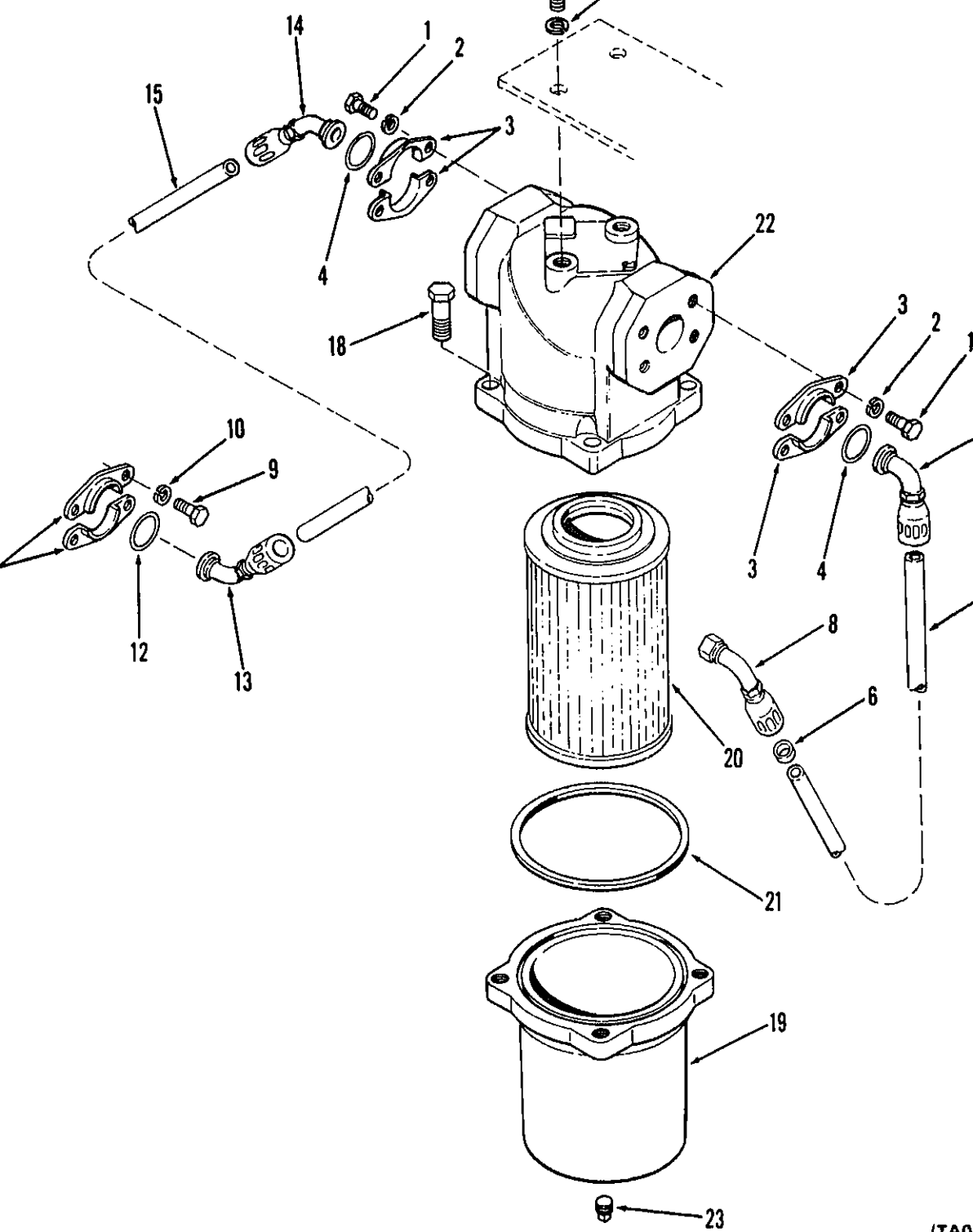
(2) Remove screws (2) and remove housing (3) from head assembly (6).

(3) Remove housing seal (4) and filter element (5) from housing (3).

(4) Wipe head assembly (6) clean and check for damage. Inspect for defects in housing (3). Defects or damage shall be reported to general support maintenance.

(5) Install new filter element (5) and housing seal (4).

(6) Install filter housing (3) on head assembly (6).



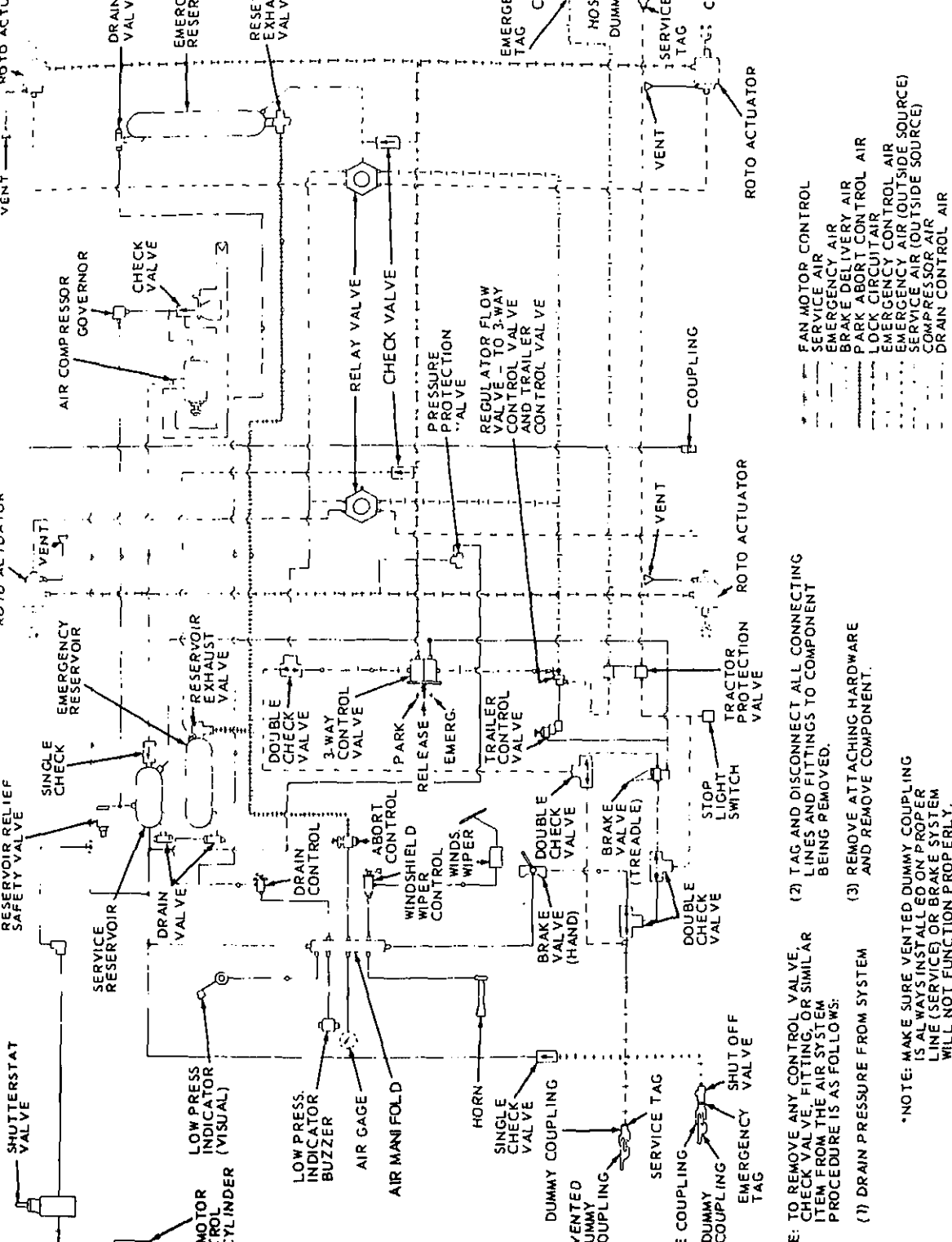
Section XVI. MAINTENANCE OF AIR AND BRAKE SYSTEM

9.49. General

a. The M32ORT carrier is equipped with service brakes on each wheel. Compressed air is used in an air brake system to set the brakes. The air brake system consists of the air compressor, valves, reservoir, brake chambers connecting

hoses and tubes and fittings. (See fig. 9-49.)

b. Prior to removing any air system component, vent the air system by pushing the drain control, and releasing all air in the system.



9-50. Brake Slack Adjuster

a. *Inspection.* Check to insure there is 1½-inch travel of the air chamber push rods when the brakes are released.

NOTE

The brakes should be applied with a minimum amount of air pressure for this check.

b. *Adjustment.* Adjust the slack adjuster on all brake chambers to the above criteria, as illustrated in figure 9-38.

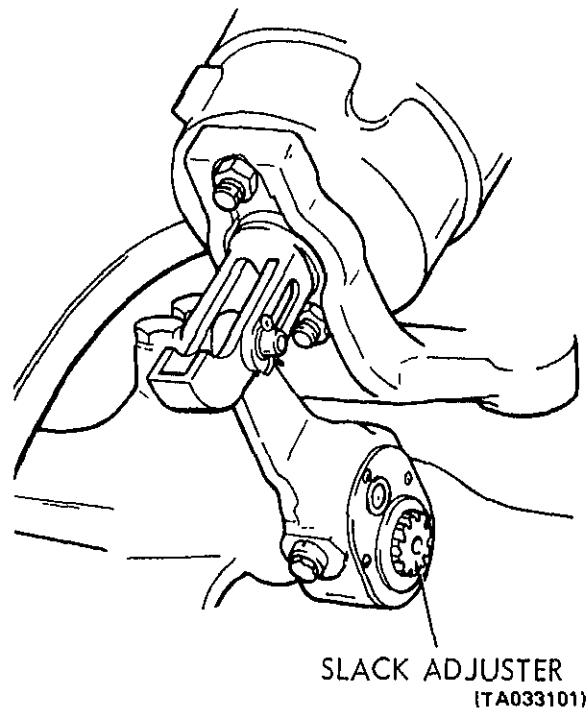


Figure 9-38. Brake adjustment, slack adjuster.

9-51. Brake Chamber

a. Removal.

(1) Remove air pressure from the air brake system as described in paragraph 9-49.

(2) Refer to figure 9-39 and remove brake chambers as follows:

(a) Tag and disconnect air lines. Cap lines

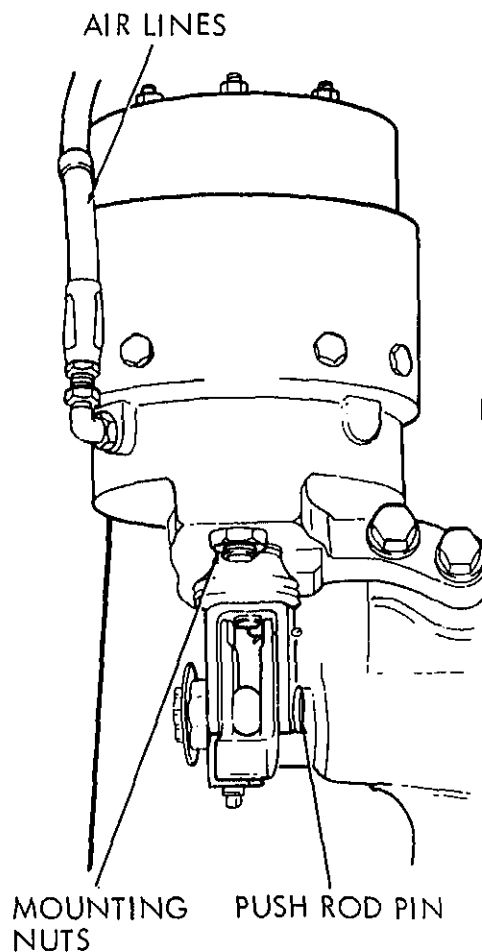


Figure 9-39. Brake chambers, removal and installation.

b. Cleaning and Inspection

(1) Clean exterior of brake chamber with damp cloth.

(2) Inspect chamber for cracks, bulges, or other defects. Replace a defective chamber.

c. Installation.

(1) Refer to figure 9-39 and install brake chamber as follows:

(a) Place brake chamber on mounting bracket and secure with mounting nuts.

(b) Place push rod on slack adjuster and install pin. Secure with cotter pin.

(c) Install air lines as tagged in removal.

- STEP 2. DISCONNECT ALL LINES AND FITTINGS.
- STEP 3. REMOVE ATTACHING HARDWARE AND LIFT ALCOHOL EVAPORATOR FROM ENGINE COMPARTMENT.

ATTACHING HARDWARE

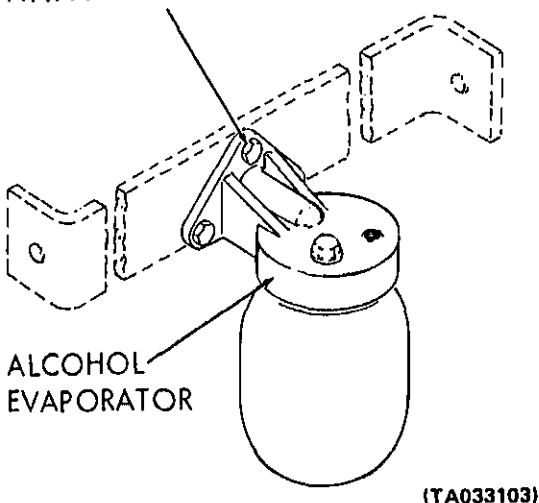


Figure 9-40. Alcohol evaporator assembly, removal and installation.

Disassembly. Refer to figure 9-41 and disassemble the alcohol evaporator as follows:

- (1) Remove filler plug (1) from evaporator body (8).
- (2) Unscrew evaporator reservoir (2) and remove reservoir gasket (3).
- (3) Remove copper tube (4) and washer (5) from body (8).
- (4) Remove air filter (6) and expansion plug (7) from evaporator body (8).

Cleaning, Inspection and Repair.

- (1) Clean all metallic parts of the evaporator with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

- (2) Inspect evaporator body for crack, breaks or other damage. Check all connections and openings in body to insure they are free of obstruction. Replace defective body.

- (1) Install expansion plug (7) and air filter into body (8).

- (2) Place washer (5) on copper tube (4) and install tube to evaporator body.

- (3) Place gasket (3) on evaporator reservoir and screw reservoir to body (8).

e. Installation. Refer to figure 9-40 and install the alcohol evaporator as illustrated.

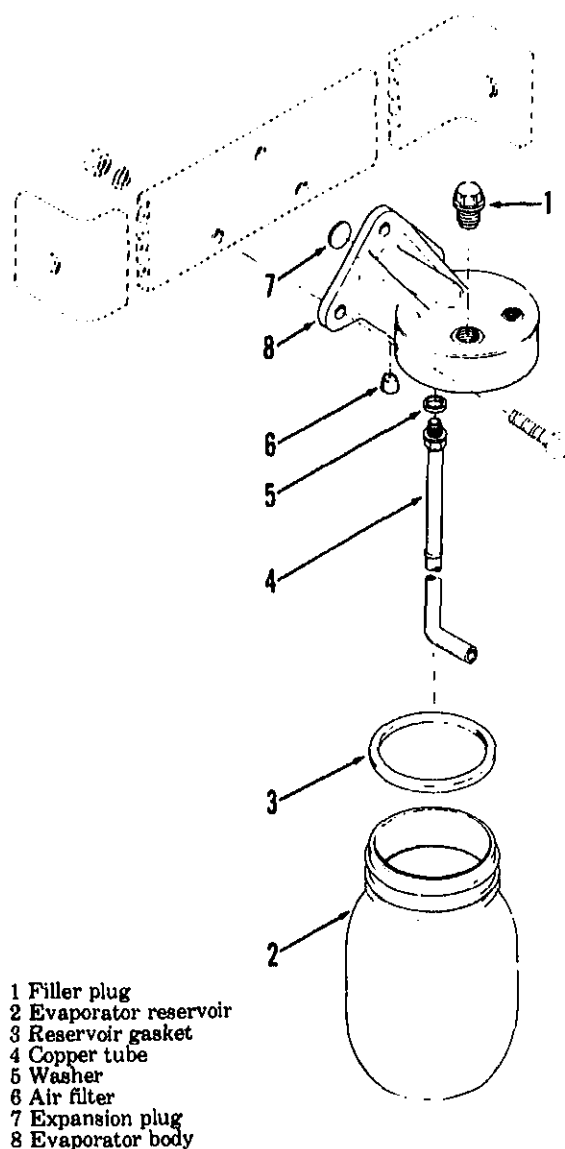


Figure 9-41. Alcohol evaporator assembly, exploded view.

Removal. Refer to figure 9-37 and remove check valves, hoses, lines and fittings as necessary.

Cleaning.

(1) Clean all metallic parts with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

(2) Clean all non-metallic parts with a damp cloth and dry thoroughly.

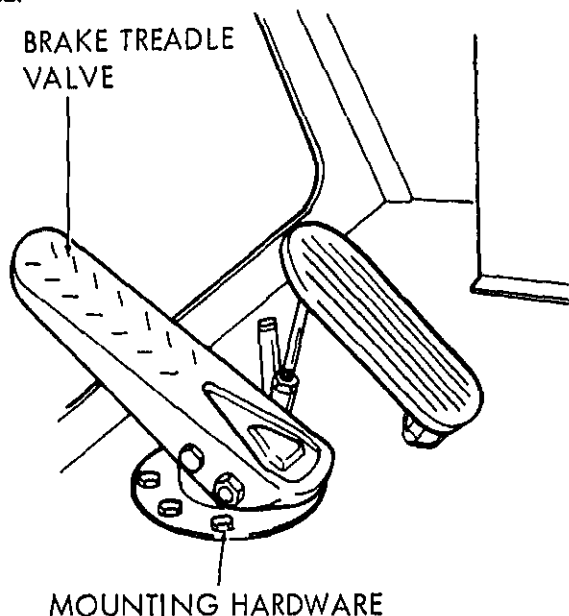
Installation. Refer to figure 9-37 and connect lines, hoses and fittings to compressor, valves and brake chambers.

9-54. Brake Valve (Treadle)

a. Removal. Refer to figure 9-42 and remove the brake valve as follows:

- (1) Relieve pressure in the air system.
- (2) Disconnect air lines from valve.
- (3) Remove brake valve as illustrated in figure 9-42.

2.



NOTE: RELIEVE PRESSURE IN THE AIR BRAKE SYSTEM.

STEP 1. TAG AND DISCONNECT ALL AIR LINES FROM VALVE UNDER CARRIER CAB FLOOR.

STEP 2. REMOVE ATTACHING HARDWARE

equivalent, and replace by a new one. (2) Inspect for cracks, breaks or other defects. Replace a defective brake valve.

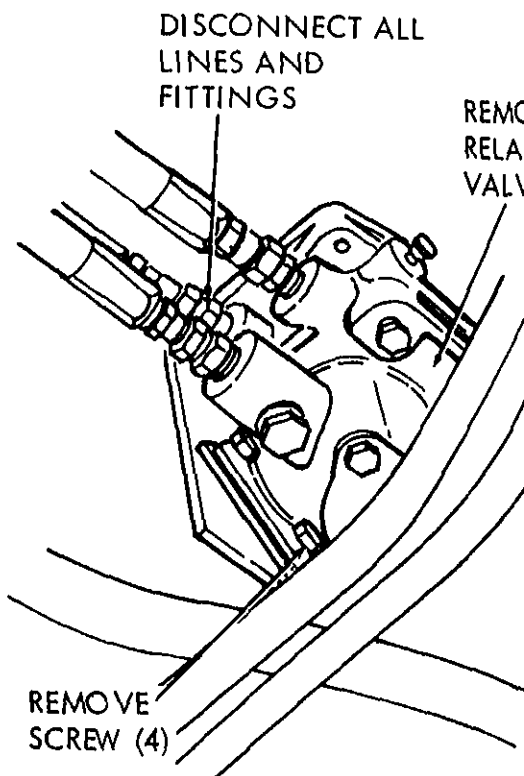
c. Installation.

(1) Install brake valve as illustrated in figure 9-42.

(2) Reconnect all air lines that were disconnected in removal.

9-55. Relay Valves

a. Removal. Refer to figure 9-43, and remove relay valves as follows:



(TA03)

Figure 9-43. Relay valves, removal and installation (shown in removal)

(1) Relieve pressure from the air system.

(2) Disconnect air lines as shown in figure 9-43.

(3) Remove attaching hardware and

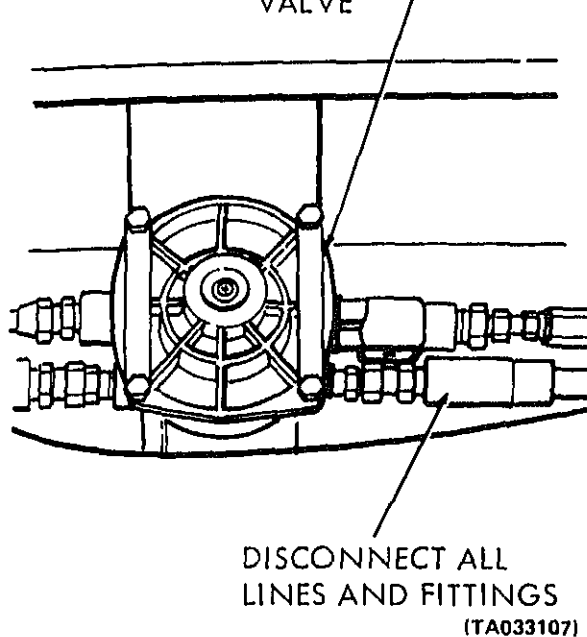


Figure 9-43. Relay valves, removal and installation (sheet 2 of 2).

(2) Inspect valves for cracks, breaks or other damage. Replace any defective relay valves.

c. *Installation.* Install relay valves as illustrated in figure 9-43.

9-56. Moisture Ejector Drain Valves

a. *Removal.* Remove drain valves when necessary as follows:

(1) Relieve pressure from the air system as described in paragraph 9-49.

(2) Disconnect air lines as shown on figure 9-47.

(3) Remove attaching hardware and lift drain valves from the vehicle.

b. *Cleaning and Inspection.*

(1) Clean all metallic parts of the drain valve with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

(2) Inspect drain valve for cracks, breaks, damaged threads or other damage. Replace defective drain valves.

c. *Installation.* Install drain valves as illustrated in figure 9-37.

from the vehicle.

b. *Cleaning and Inspection.*

(1) Clean all metallic parts of the emergency park brake control valve with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

(2) Inspect for cracks, breaks or other damage. Replace defective control valve.

c. *Installation.* Install control valve as illustrated in figure 9-37.

9-58. Trailer Control Valve

a. *Removal.* Refer to figure 9-44 and remove trailer control valve as follows:

(1) Relieve pressure in the air system as described in paragraph 9-49.

(2) Tag and disconnect air lines.

(3) Remove mounting nuts and lift trailer control valve from steering column.

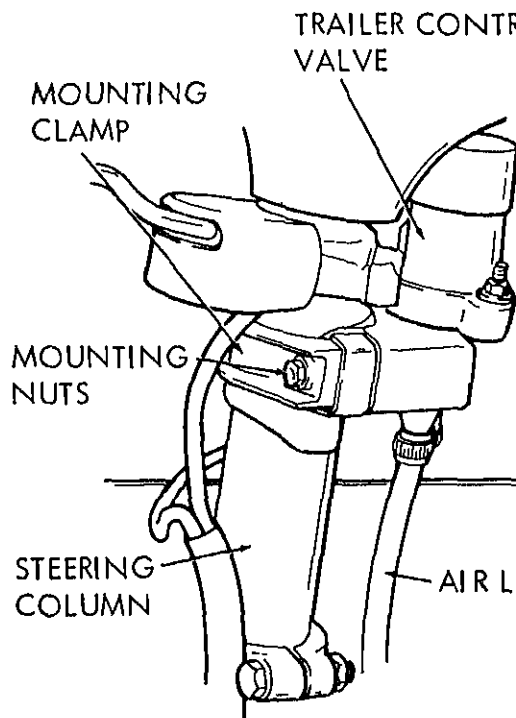


Figure 9-44. Trailer brake control valve, removal and installation.

b. *Cleaning and Inspection.*

(1) Clean all metallic parts of the trailer control valve with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

9-59. Pressure Protection Valve

a. Removal. Remove the pressure protection valve when necessary as follows:

- (1) Relieve pressure from the air system.
- (2) Tag and disconnect air lines as shown in figure 9-37.

P-D-680, or equivalent) and dry.
(2) Inspect protection valve for wear or other damage. Replace defective valve.

c. Installation. Install valve as shown in figure 9-37.

Section XVII. MAINTENANCE OF STEERING ASSEMBLY

9-60. General

The M320RT carrier has a mechanical steering system with hydraulic power assist. Both front and rear steering is controlled by the steering wheel. The steering hydraulic system is shown in figure 9-45.

9-61. Steering Gear Assembly

- a.* Lubricate steering gear and related linkage as described in LO5-3810-295-12.
- b.* Check steering gear mounting bolts, pitman

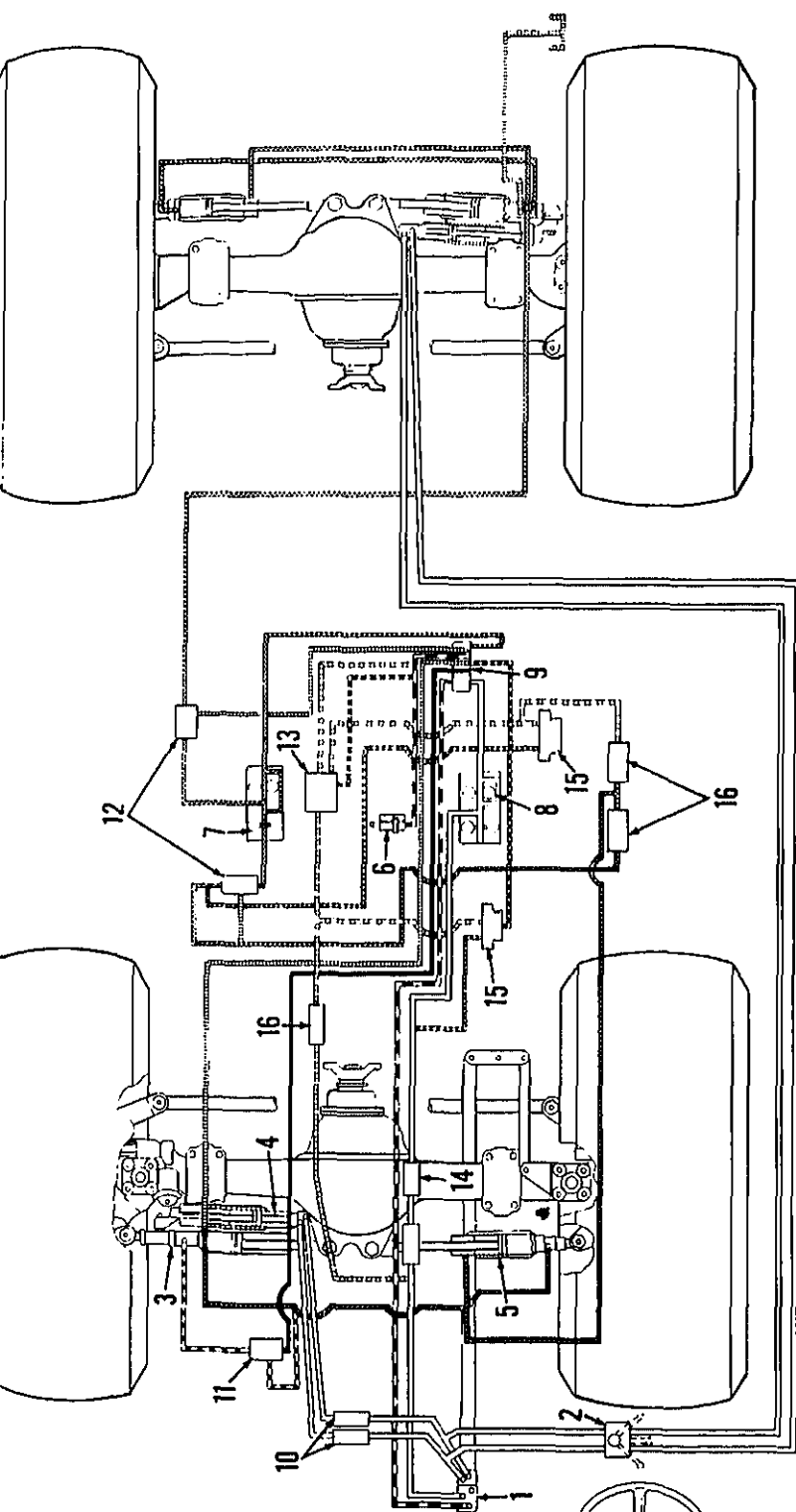
arm nut, and gear housing cover bolts. Tighten as required.

NOTE

If excessive looseness is evident in the steering system report the condition for direct support maintenance and/or repair.

9-62. Hose, Lines and Fittings

Refer to figure 9-45 and remove the steering hydraulic system hoses and fittings.



| ITEM | NOMENCLATURE |
|------|---------------------------------------|
| 1 | STEERING CONTROL VALVE |
| 2 | STEERING SELECTION VALVE |
| 3 | TANDEM UNIT STEERING CYLINDER & VALVE |
| 4 | SPRING LOADED SELF CENTERING CYLINDER |
| 5 | STEER CYLINDER |
| 6 | RELIEF VALVE |
| 7 | DUAL PUMP |
| 8 | DUAL PUMP |
| 9 | RESERVOIR |
| 10 | CHECK VALVE-ORIFICE |
| 11 | CONTROL VALVE |
| 12 | FLOW CONTROL & RELIEF VALVE |
| 13 | PUMP, EMERGENCY STEERING |
| 14 | FLOW DIVIDER VALVE |
| 15 | CHECK VALVE PILOT-ORIFICE |
| 16 | CHECK VALVE |

9-63. General

The carrier frame is an all welded high yield strength, low carbon, steel structure with cross members, supporting brackets welded integrally with the frame. The carrier frame supports and carries the crane and all components. For towing purposes, a pintle hook is mounted on the rear. Refer to TM 9-237 for welding techniques to be used on the frame.

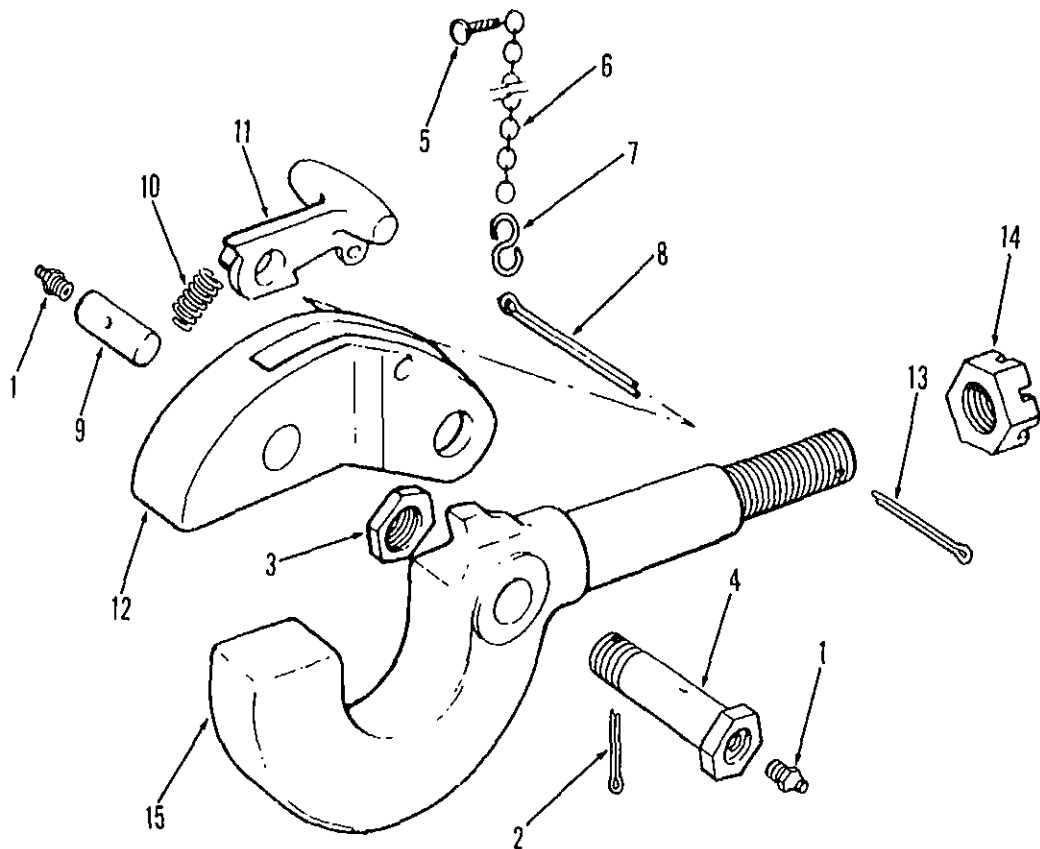
9-64. Frame

Inspect the frame for cracks, breaks or defects. Report all indicated damage to support maintenance.

9-65. Pintle Hook

a. Removal and Disassembly. Refer to 9-46 and remove pintle hook as follows:

(1) Remove cotter pin (13) and nut (14) and move pintle hook assembly from frame.



- 1 Fitting
- 2 Cotter pin
- 3 Nut
- 4 Bolt
- 5 Drive screw
- 6 Chain
- 7 Hook
- 8 Cotter pin

- 9 Pivot pin
- 10 Spring
- 11 Latch
- 12 Latch lock
- 13 Cotter pin
- 14 Nut
- 15 Hook

(1) Clean all parts of the pintle hook with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

(2) Inspect all parts for defective condition. Replace all defective parts.

c. *Reassembly and Installation.* Refer to figure 9-46 and reassemble and install as follows:

(1) Place spring (10) on front of latch (11) and carefully place in latch lock (12). Holding latch in place, push pivot pin (9) through latch and latch lock.

(2) Install cotter pin (8), hook (7) and chain (6).

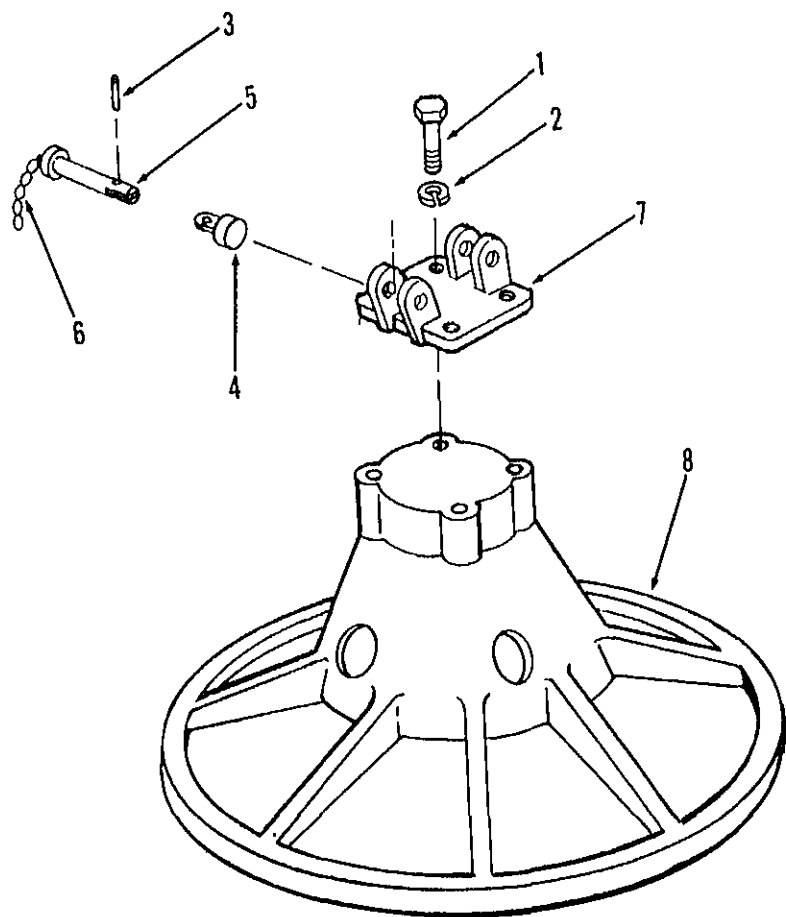
(4) Install tube fittings (1) into bolt pivot pin (9).

(5) Install pintle hook assembly to frame and secure with nut (14) and cotter pin (13).

9-66. Float Pads

a. *Removal and Disassembly.* Refer to figure 9-47 and remove and disassembly the float pad as follows:

(1) Remove mounting pin assembly from float plate (7) and drop float pad from outrigger



1 Capscrew
2 Lockwasher
3 Roll pin
4 Toggle

5 Bar pin
6 Chain
7 Float plate
8 Float pad

(2) Inspect all parts for cracks, breaks or other defects. Replace all defective components.

c. Reassembly and Installation. Refer to 9-47 and assemble and install float pad as follows:

(1) Place toggle (4) on bar pin (5) and chain (6) and secure with lockwashers (2) and capscrews (1).

(2) Place float plate (1) on float pad (6) and secure with lockwashers (2) and capscrews (1).

(3) Position float pad (8) on outrigger and install pin bar assembly in float plate (7) securing pad to outrigger.

Section XIX. MAINTENANCE OF BODY, CAB AND HOOD

9-67. General

The carrier cab is designed to accommodate only one driver and is mounted on the left front side of the carrier frame. The top position of the cab can be removed as a complete unit.

9-68. Cab Assembly

Inspect cab assembly for cracks, breaks, and other damage. Report above damage to direct support maintenance. Check for cracked or broken glass. Check doors for dents, cracks or other damage. Replace door and glass as necessary.

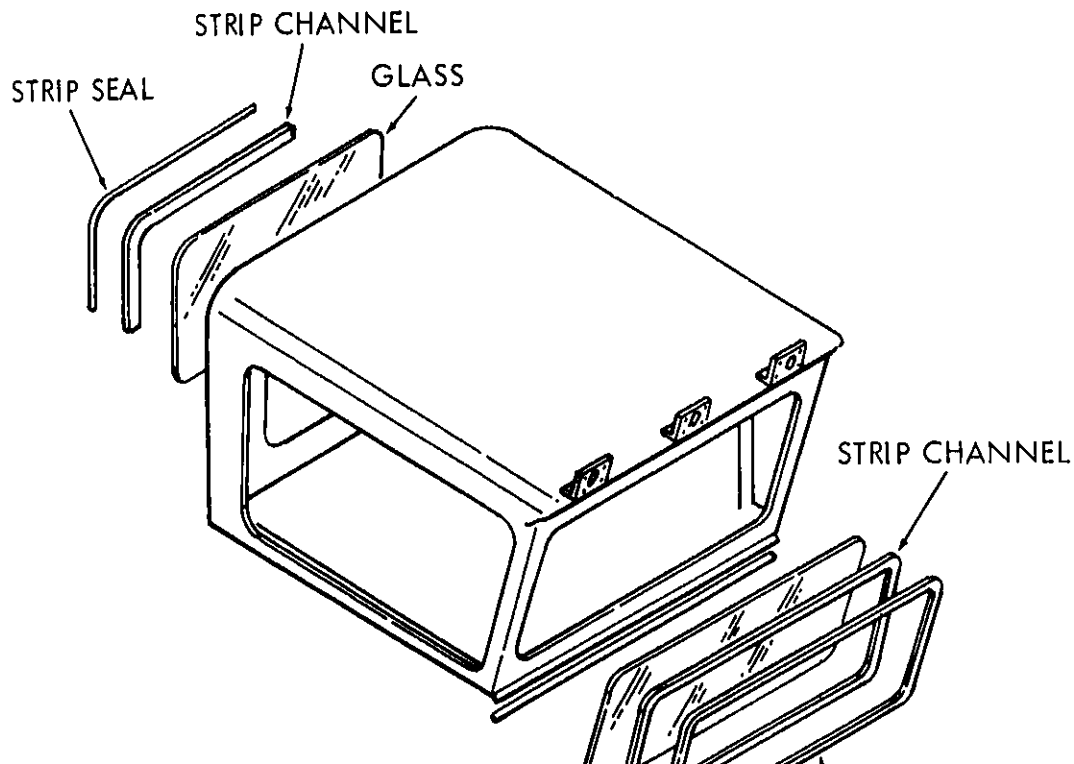
9-69. Windshield, Small Side and Window Glass

a. Removal. Refer to figure 9-48 and remove glass as follows:

(1) Insert a suitable tool under the weather seal strip. Slide tool around weather strip and move seal strip.

(2) Place a suitable tool at the seam between weather strip between weather strip and edge of the glass.

(3) Slide tool around the glass edge and apply pressure gently to remove glass.



ing and Inspection.

an window panel edges with cleaning

pect weather stripping for cracks, dete-
and other damage. Check all glass for

place all cracked glass and damaged

lution. Refer to figure 9-48 and install
llows:

ply a coating of rubber cement to panel
nd window opening, rubber weather
lass edge.

install weather stripping around the win-
ing with a 1/4-inch overlap at ends.

ice weather stripping channel ends to-

gether and press into place to obtain a tight
smooth joint.

(4) Place glass carefully into one of the lower
corners of weather stripping channel.

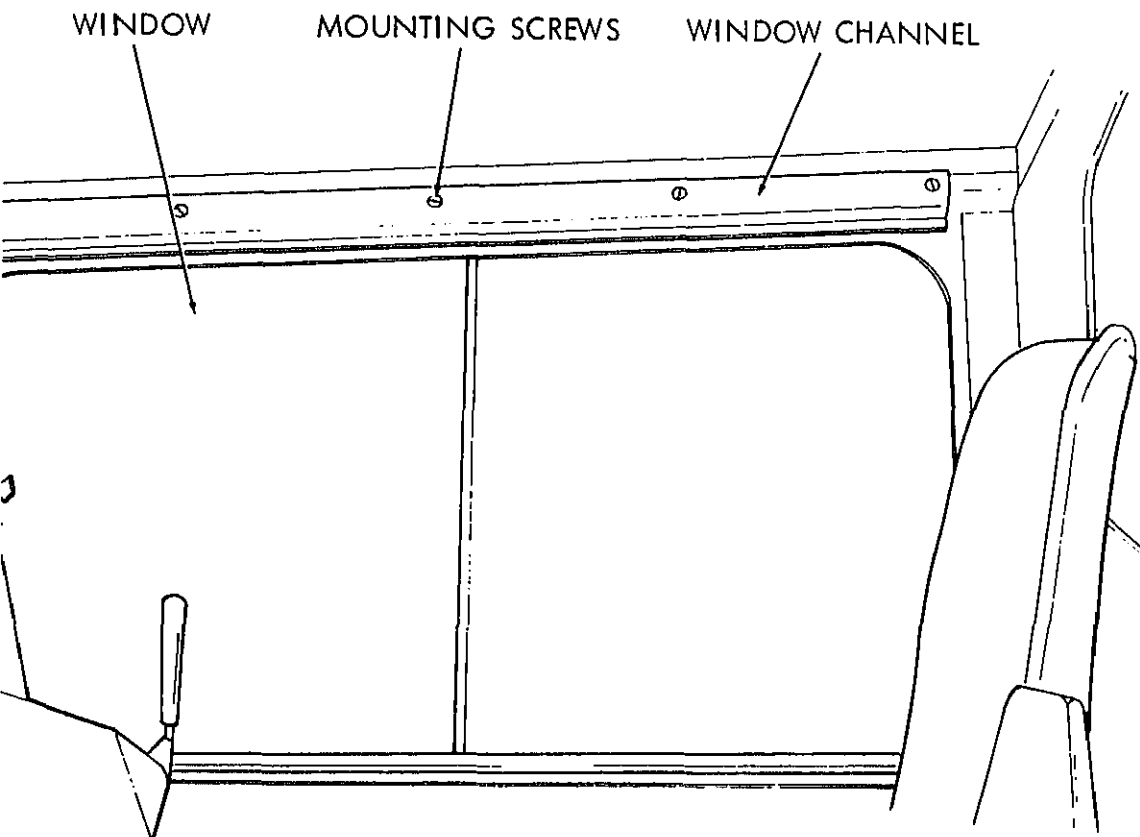
(5) With a suitable tool open the weather
stripping channel and allow the glass to slide into
the channel.

(6) With a suitable tool inserted into the
weather stripping channel, force seal strip into
place.

9-70. Side Window Glass

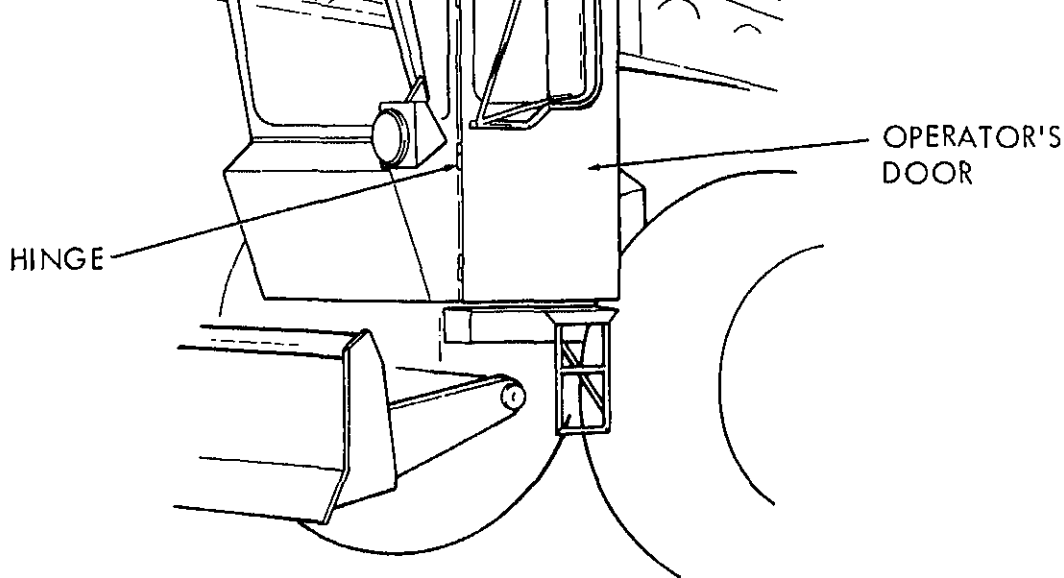
a. Removal. Refer to figure 9-49 and remove side
window glass as follows:

(1) Remove screws from upper window chan-
nel and remove channel.



(TA033113)

Figure 9-49. Side window, removal and installation.



STEP 1. OPEN OPERATORS DOOR AND LIFT UP. REMOVE DOOR FROM CARRIER CAB.

STEP 2. REMOVE DOOR STOP FROM INSIDE OF OPERATOR'S DOOR.

(TA03)

Figure 9-50. Operators door, removal and installation.

b. Cleaning and Inspection.

(1) Clean metallic portions of the operators door with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

(2) Inspect door for dents, breaks or defective parts. Replace defective door as required.

(3) Check glass in door for cracks, chips or other damage. Replace damaged glass as follows:

(a) Remove door and window handles.

(b) Remove inner door panel.

(c) Remove damaged glass from window channel and install new glass.

(d) Install inner door panel.

(e) Install door and window handles.

c. Installation. Refer to figure 9-50 and install operators door as illustrated.

9-72. Operators Seat

operators seat as illustrated.

b. Cleaning and Inspection.

(1) Clean all metallic parts of the seat assembly with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

(2) Clean seat cushions with soap and water.

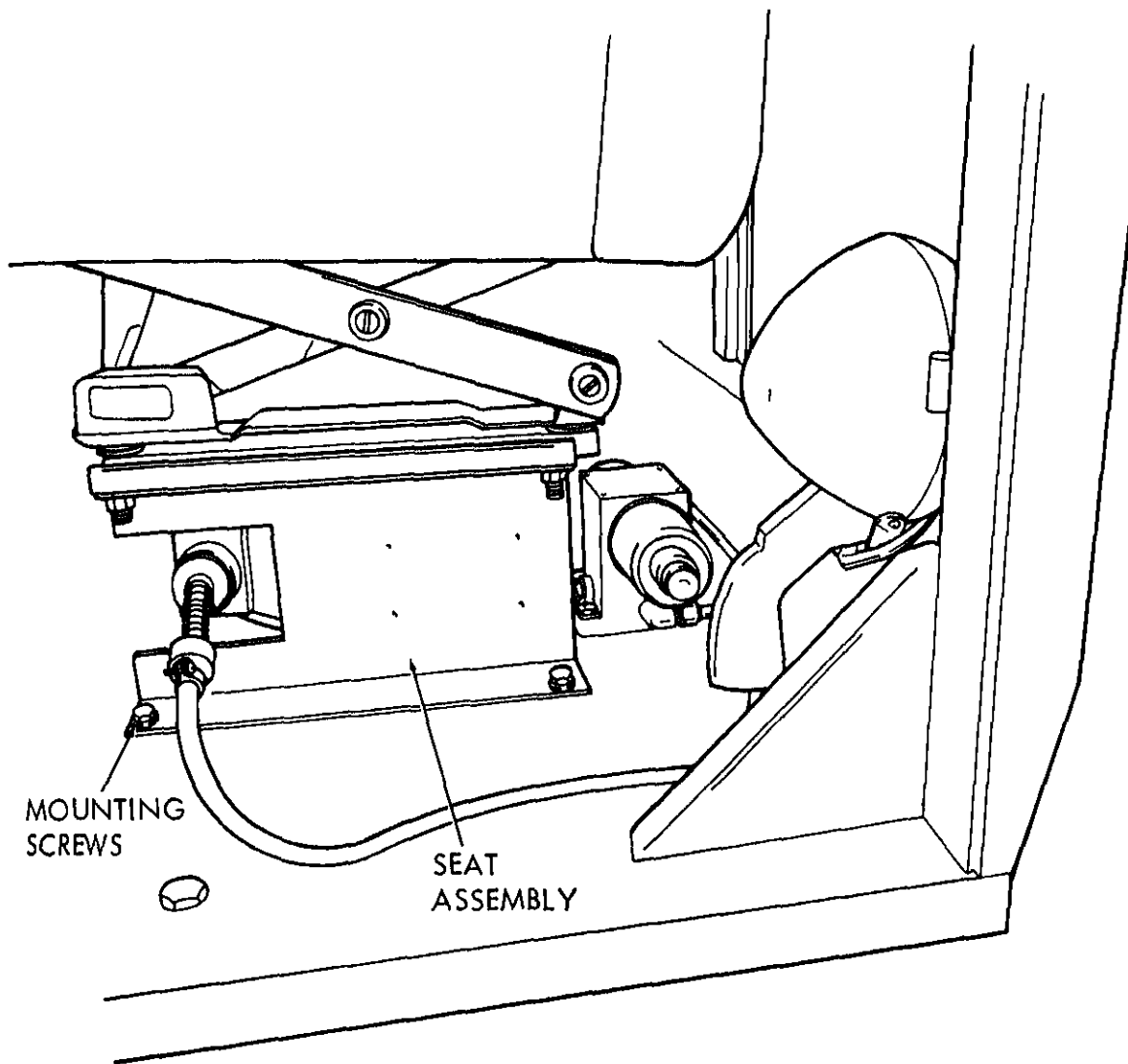
(3) Inspect cushions for ripped or torn fabric and/or broken springs. Replace cushion as required.

(4) Inspect seat frame and suspension for cracks, breaks and bends. Replace damaged assembly.

c. Installation. Refer to figure 9-51 and install seat assembly as illustrated.

9-73. Seat Belts

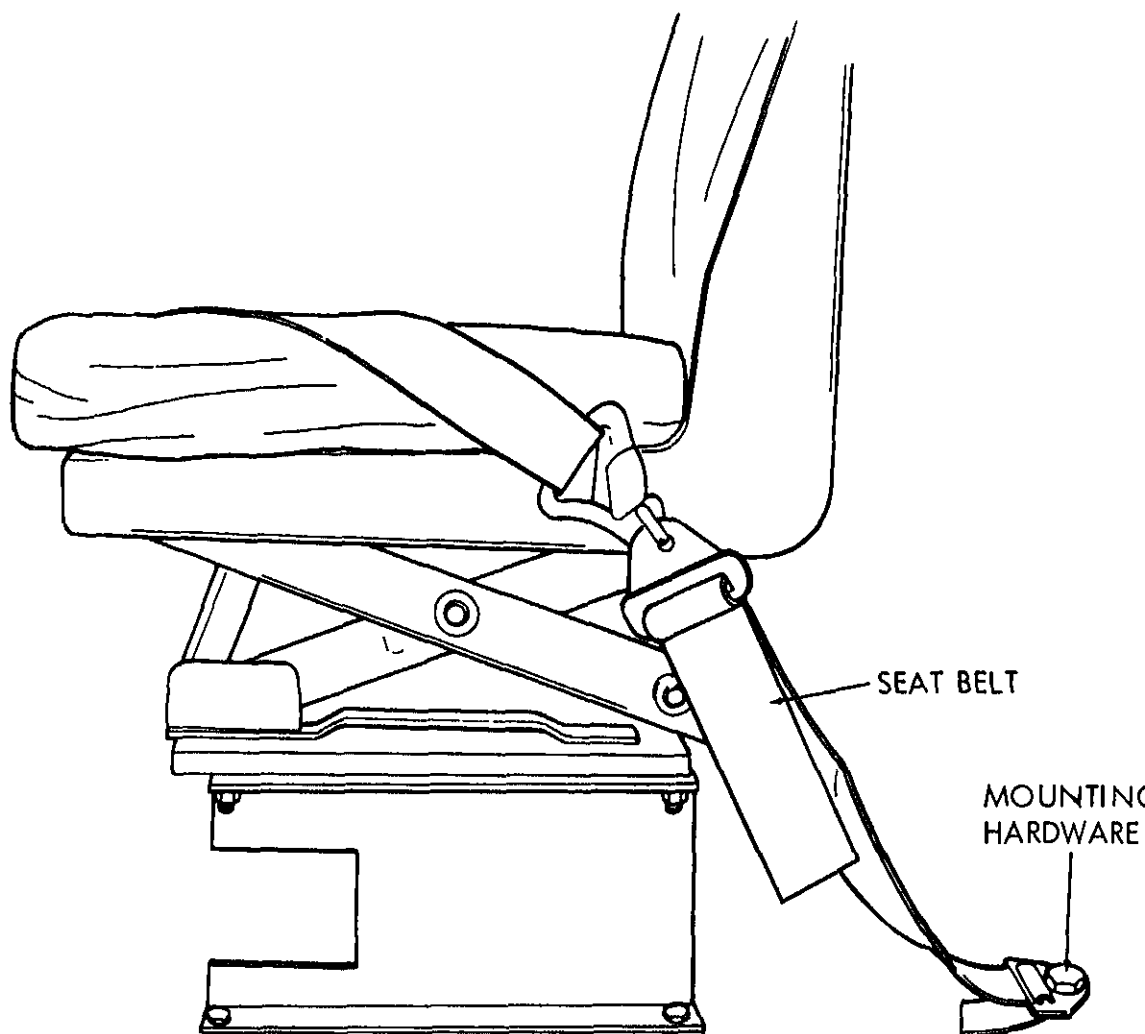
a. Removal. Refer to figure 9-52 and remove seat belts as illustrated. Both ends are similar.



- STEP 1. REMOVE MOUNTING SCREWS FROM SEAT ASSEMBLY.
STEP 2. LIFT SEAT ASSEMBLY FROM CARRIER CAB FLOOR.

(TA0

Figure 9-51. Operator's seat, removal and installation.



STEP 1. REMOVE MOUNTING HARDWARE AND LIFT SEAT BELT FROM CAB. (TAB)

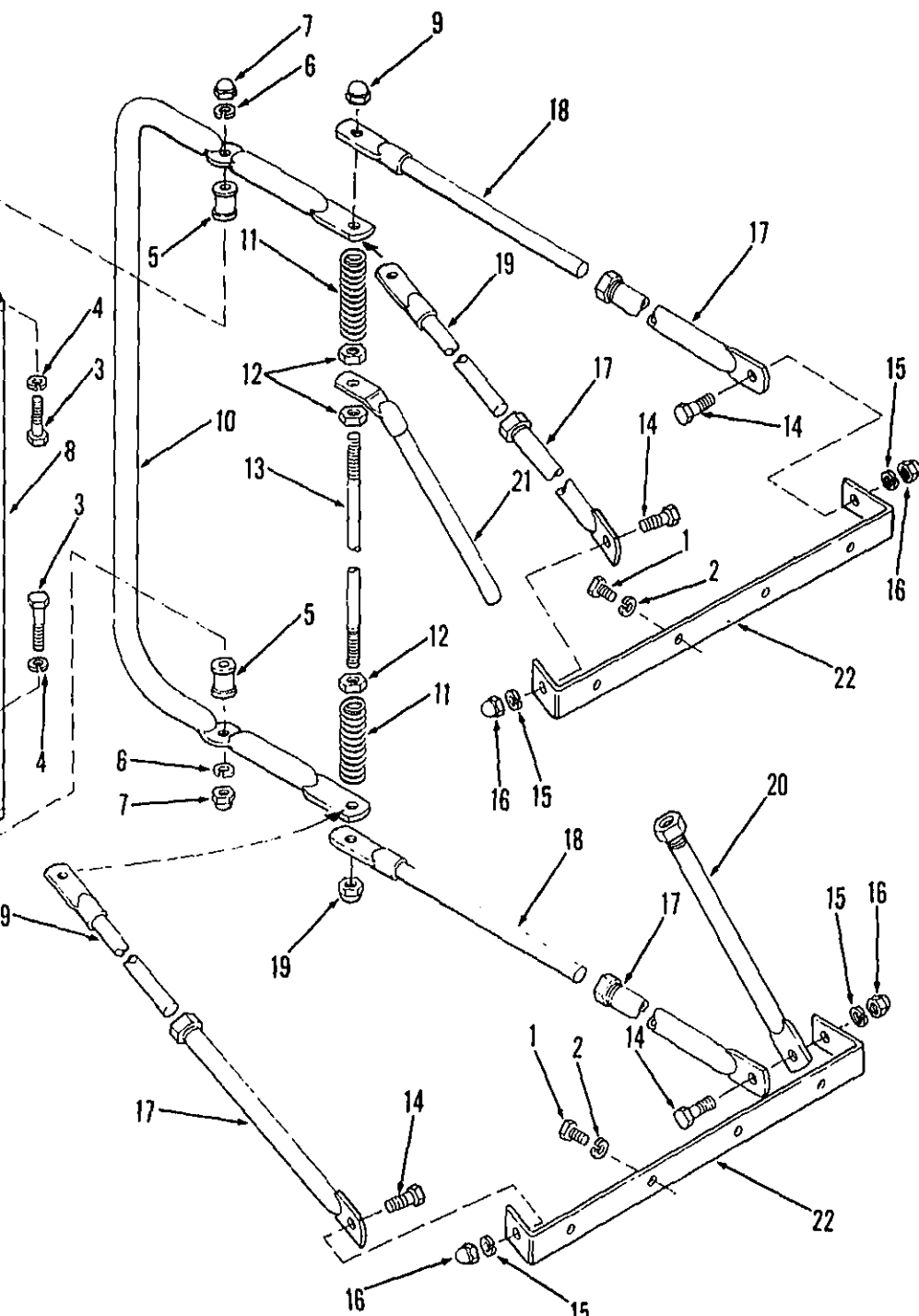
Figure 9-52. Operator's seat belt, removal and installation.

b. Cleaning and Inspection.

(1) Clean seat belts with soap and water

defective seat belt.

c. Installation. Refer to figure 9-52.



(5) Remove cap screws (14), lockwashers (15) and nuts (16). Remove mirror legs (17, 18 and 19) and cross braces (20 and 21) from mounting brackets (22).

(6) Separate mirror legs and cross braces as necessary.

b. Cleaning and Inspection.

(1) Clean all metallic parts of the rear view mirror with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

(2) Inspect for cracked or chipped mirror. Check for bent, cracked or broken components. Replace all damaged parts.

c. Reassembly and Installation.

(1) Assemble mirror legs (17) and cross braces

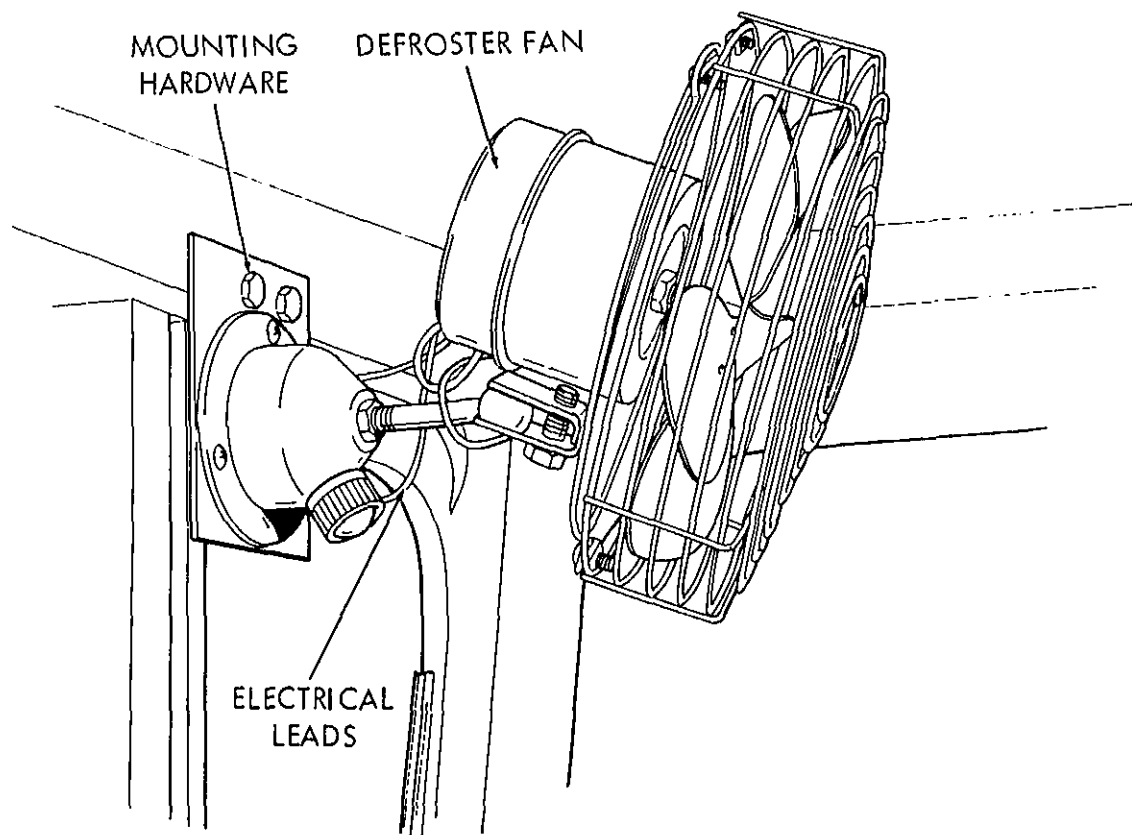
(12) on one end of the pivot rod.
(5) Install springs (11), detent loop (10) and mirror legs (18 and 19) on pivot rod and with nuts (9).

(6) Position mirror head (8) between detent loop (10) and secure with nuts (7), lockwashers (4), and cap screws (3).

(7) Mount mirror assembly on carrier with lockwashers (2) and cap screws (1).

9-75. Defroster Fan

a. Removal. Refer to figure 9-54 and remove defroster fan as illustrated.



STEP 1. TAG AND DISCONNECT ALL ELECTRICAL LEADS TO THE FAN ASSEMBLY.

STEP 2. REMOVE MOUNTING HARDWARE AND REMOVE FAN ASSEMBLY FROM CARRIER CAB.

llation. Refer to figure 9-54 and install
ster fan as illustrated.

Windshield Wiper

Removal and Disassembly. Refer to figure 9-54 and remove and disassemble the windshield wiper as follows:

1. Disconnect air line to wiper motor.
2. Remove pressure regulating valve (1), tube nut (2) and tube union (3).

3. Remove cap nut (10) and lockwasher (11).
4. Using suitable tool, apply pressure carefully to wiper arm assembly and pry wiper arm (5) from wiper (12). Separate wiper blade (4) from wiper arm (5).

5. Remove arm driver (12), nut (13) and lockwasher (14) and (15).

6. Remove screws (16) and lift motor assembly from operator's cab. Remove mounting plate (17) and washers (18).

7. Remove screws (6) and cover (7). Remove wiper arm and shield (9).

8. Remove valve head silencer (19) from valve head (20).

9. Remove screws (20) and pull valve head gasket (22) off motor cylinder (29). Unscrew valve stem (23) from valve stop (28).

10. Remove screws (24) and remove end plate (25). Remove gasket (26) from motor cylinder (29).

11. Lift gear and shaft (27) from motor cylinder (29). Remove valve stop (28).

Cleaning, Inspection and Repair.

1. Clean all metallic parts of the windshield wiper assembly with cleaning solvent (Fed. Spec. 913-10-1 or equivalent) and dry thoroughly.

2. Inspect parts for cracks, breaks or other damage. Check wiper blade for deterioration or damage.

3. Repair by replacing all damaged or defective parts.

4. (2) Install a new gasket (26) and end plate (25) on the motor cylinder. Secure with screws (24).

5. (3) Screw valve stem (23) into valve stop (28). Install a new gasket (22) and valve head (21) on the motor cylinder. Secure with screws (20).

6. (4) Assemble valve head silencer (19) to the valve head.

7. (5) Place shield (9) over the gear and shaft opening in the motor cylinder. Secure with screws (6).

8. (6) Place cover (7) on shield (9) and secure with screws (6).

9. (7) Install mounting plate (17), washers (18) and motor assembly to the cab panel and secure with screws (16).

NOTE

Care must be taken in aligning driving shaft of wiper motor through mounting bracket. Rotating shaft must not touch mounting bracket.

10. (8) Install washers (15 and 14) and nut (13) to driving shaft.

11. (9) Press arm driver (12) on driving shaft and press wiper arm (5) on arm driver. Secure with lockwasher (11) and nut (10).

12. (10) Assemble wiper blade (4) to wiper arm (5).

13. (11) Install tube union (3), tube nut (2) and pressure regulating valve (1).

14. (12) Reconnect air line to regulating valve.

9-77. Heater Assembly

a. Removal. Refer to figure 9-56 and remove heater assembly as illustrated.

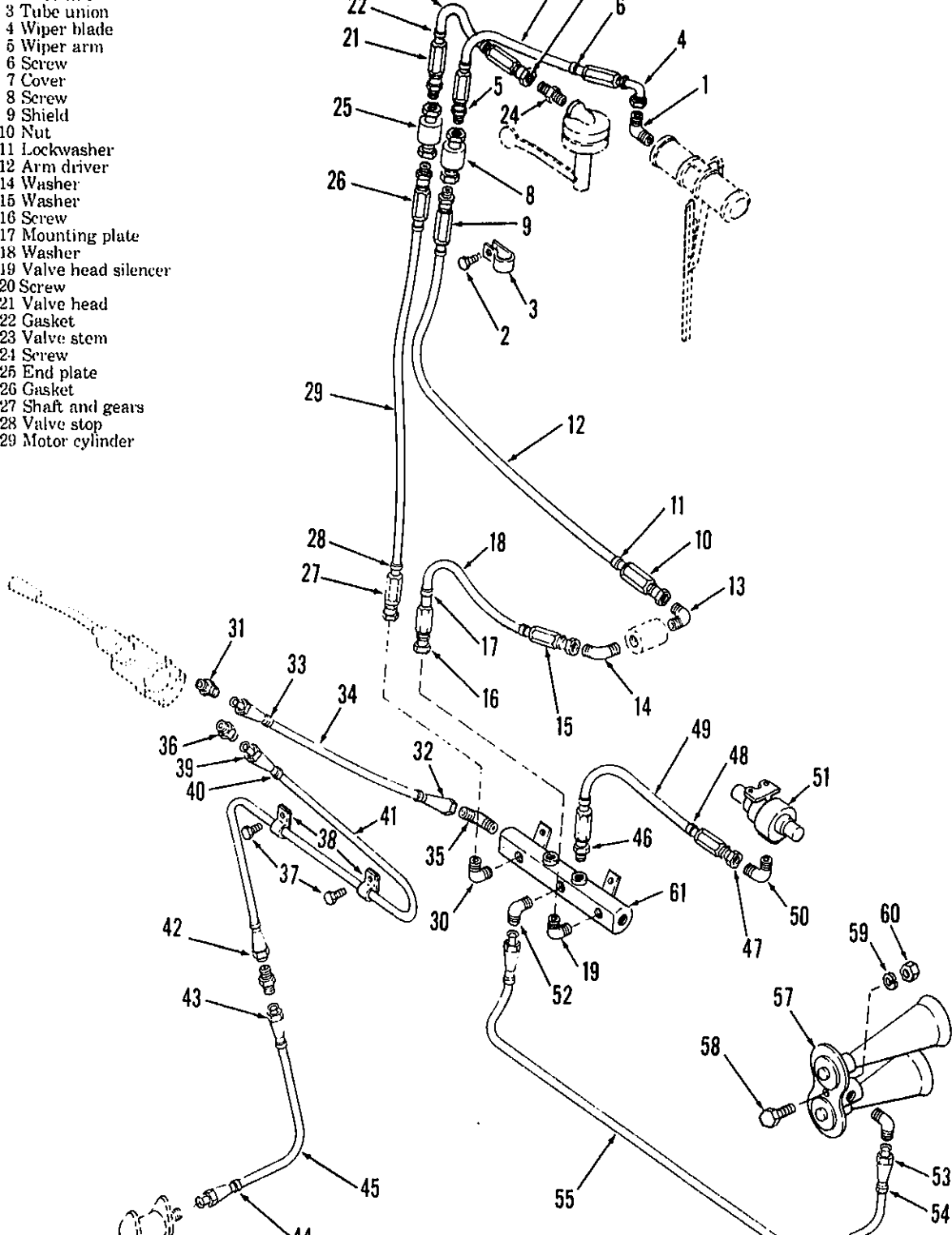
b. Cleaning and Inspection.

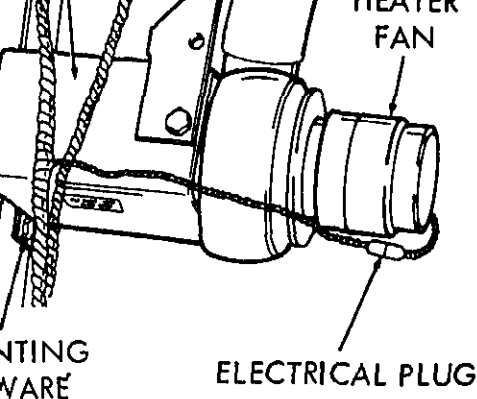
(1) Clean exterior of heater assembly with clean damp cloth and dry thoroughly.

(2) Inspect heater assembly for leaks, cracks or other damage. Replace a defective heater assembly.

c. Installation. Refer to figure 9-56 and install heater assembly as illustrated.

- 3 Tube union
- 4 Wiper blade
- 5 Wiper arm
- 6 Screw
- 7 Cover
- 8 Screw
- 9 Shield
- 10 Nut
- 11 Lockwasher
- 12 Arm driver
- 14 Washer
- 15 Washer
- 16 Screw
- 17 Mounting plate
- 18 Washer
- 19 Valve head silencer
- 20 Screw
- 21 Valve head
- 22 Gasket
- 23 Valve stem
- 24 Screw
- 25 End plate
- 26 Gasket
- 27 Shaft and gears
- 28 Valve stop
- 29 Motor cylinder





- UNPLUG ELECTRICAL PLUG FROM HEATER FAN.
- REMOVE HEATER HOSE FROM HEATER ASSEMBLY.
- REMOVE MOUNTING HARDWARE AND LIFT HEATER ASSEMBLY FROM CARRIER CAB.

(TA033120)

9-56. Heater assembly, removal and installation.

Section XXI. MAINTENANCE OF HYDRAULIC SYSTEM

General

The hydraulic system operates the utility outriggers and for steering assistance. The system consists of a pump, hoses, tubes, fittings, accumulator, fluid reservoir, control valves, hoses and filters. Refer to figure 1-7 for the hydraulic systems schematic.

CAUTION

When disconnecting hoses, lines or components of the hydraulic system extreme care must be taken to prevent dirt or foreign matter from entering the system.

Hoses and Fittings

Inspection. Refer to figure 1-7 and check all

hoses and fittings for leaks. Inspect for cracks and deterioration or other defects. Replace all defective hydraulic hoses.

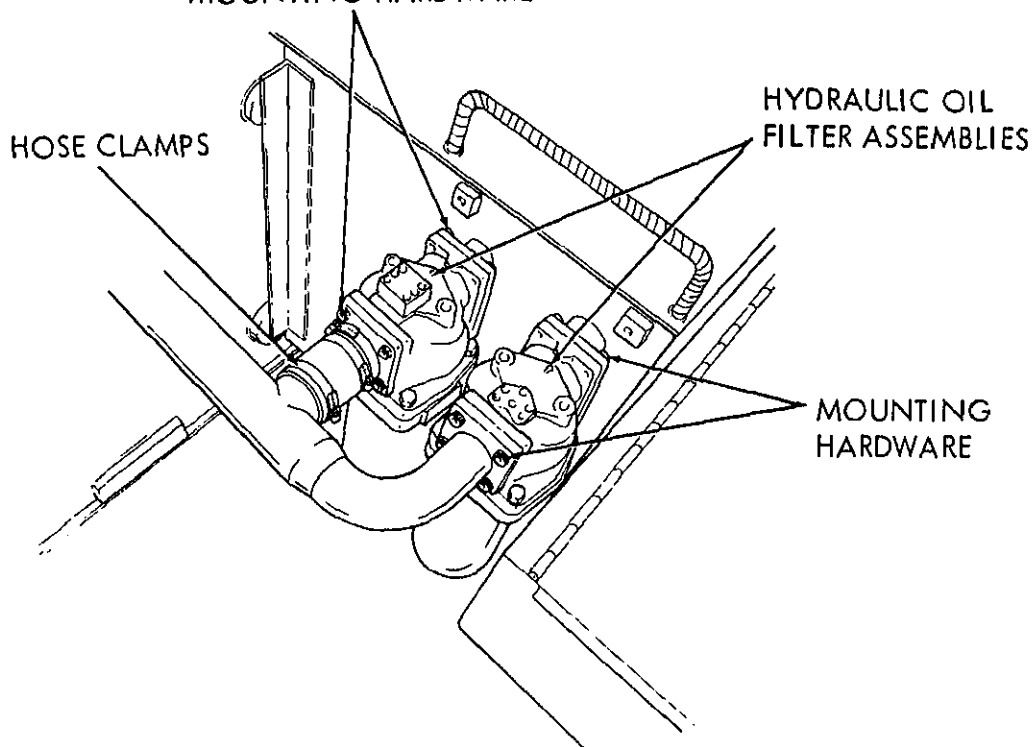
b. *Replacement.* Tag and disconnect defective hydraulic hoses as necessary. Cap or cover all openings to prevent dirt or foreign material from entering the hydraulic system. Replace all hoses and fittings as required.

9-80. Hydraulic Oil Filter

a. *Removal.* Refer to figure 9-57 and remove hydraulic oil filters as illustrated.

b. *Disassembly.* Refer to figure 9-58 and disassemble the oil filters as follows:

(1) Remove drain plug (1) and drain fluid into container of suitable size.



- STEP 1. DRAIN HYDRAULIC FLUID INTO A CONTAINER OF SUITABLE SIZE.
- STEP 2. REMOVE MOUNTING HARDWARE AND REMOVE HYDRAULIC OIL FILTER ASSEMBLIES.

(TA03312)

Figure 9-57. Hydraulic oil filter, removal and installation.

- (2) Remove bolts (2) and remove filter housing assembly from filter head (4).
- (3) Remove seal (3) and preformed packing (5) in housing (9).
- (4) Remove filter elements (6 and 8) and element sleeve (7) from filter housing.

Cleaning and Inspection.

- (1) Clean all metallic parts of the oil filters in cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.
- (2) Discard and replace preformed packing, seal, and filter elements.
- (3) Inspect for cracks, breaks or other damage. Replace defective parts.

Reassembly. Refer to figure 9-58 and reas-

- (4) Install drain plug (1) to bottom of filter housing.

e. Installation. Refer to figure 9-57 and install hydraulic oil filters as illustrated.

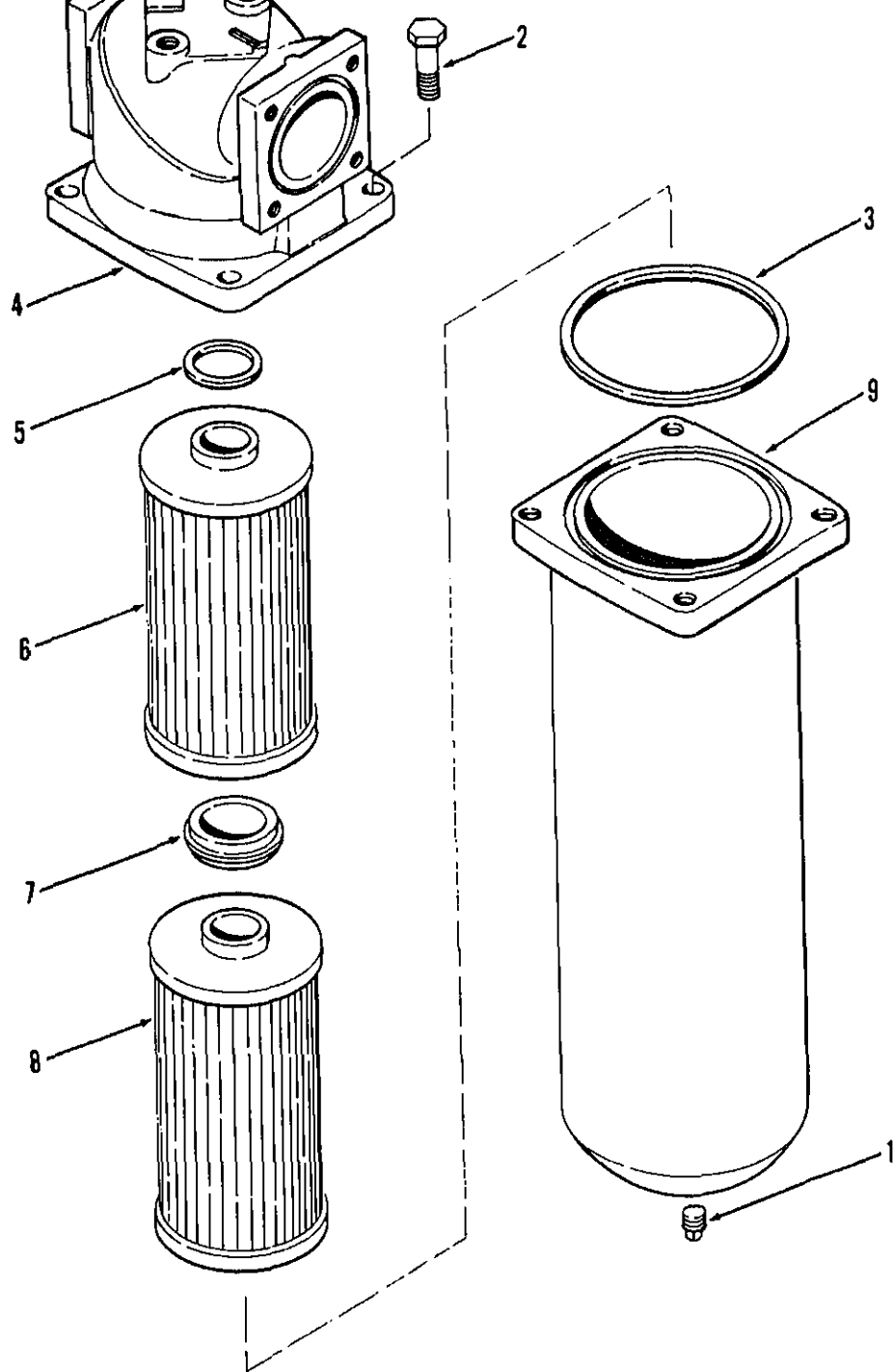
9-81. Steering, Fan Drive and Direct Control Valves

a. Removal. Refer to figure 1-7 and remove necessary control valve as follows:

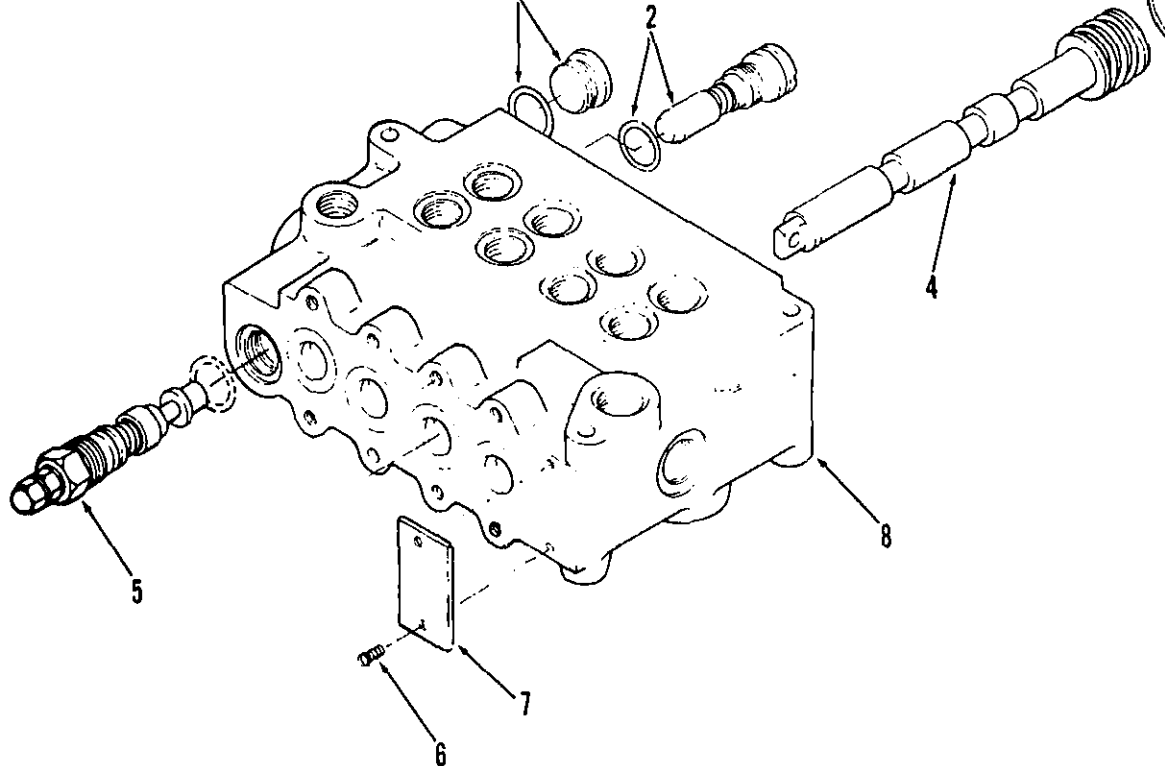
- (1) Remove and cap all hydraulic lines to control valve.
- (2) Remove mounting hardware and lift control valve from the vehicle.

b. Disassembly. Refer to figure 9-59 and disassemble the control valve as follows:

- (1) Remove plug and body (1) from valve



1 Drain plug
2 Bolt
3 Seal



- 1 Plug and body
- 2 Check valve
- 3 Spool cap
- 4 Spool
- 5 Relief Valve
- 6 Screw
- 7 Name plate
- 8 Valve body

Figure 9-50. Control valves - exploded view.

(5) Remove screws (6) and name plate (7).

c. Cleaning, Inspection and Repair.

(1) Clean all metallic parts with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

(2) Inspect for cracks, breaks, stripped threads, corrosion or other defects.

(3) Replace all gaskets, packings and defective parts.

(3) Install check valve and ring and body (1).

e. Installation. Refer to figure 1-7 control valve to vehicle as follows:

(1) Position control valve and install hardware.

(2) Uncap and connect all hydraulic lines that were disconnected during removal.

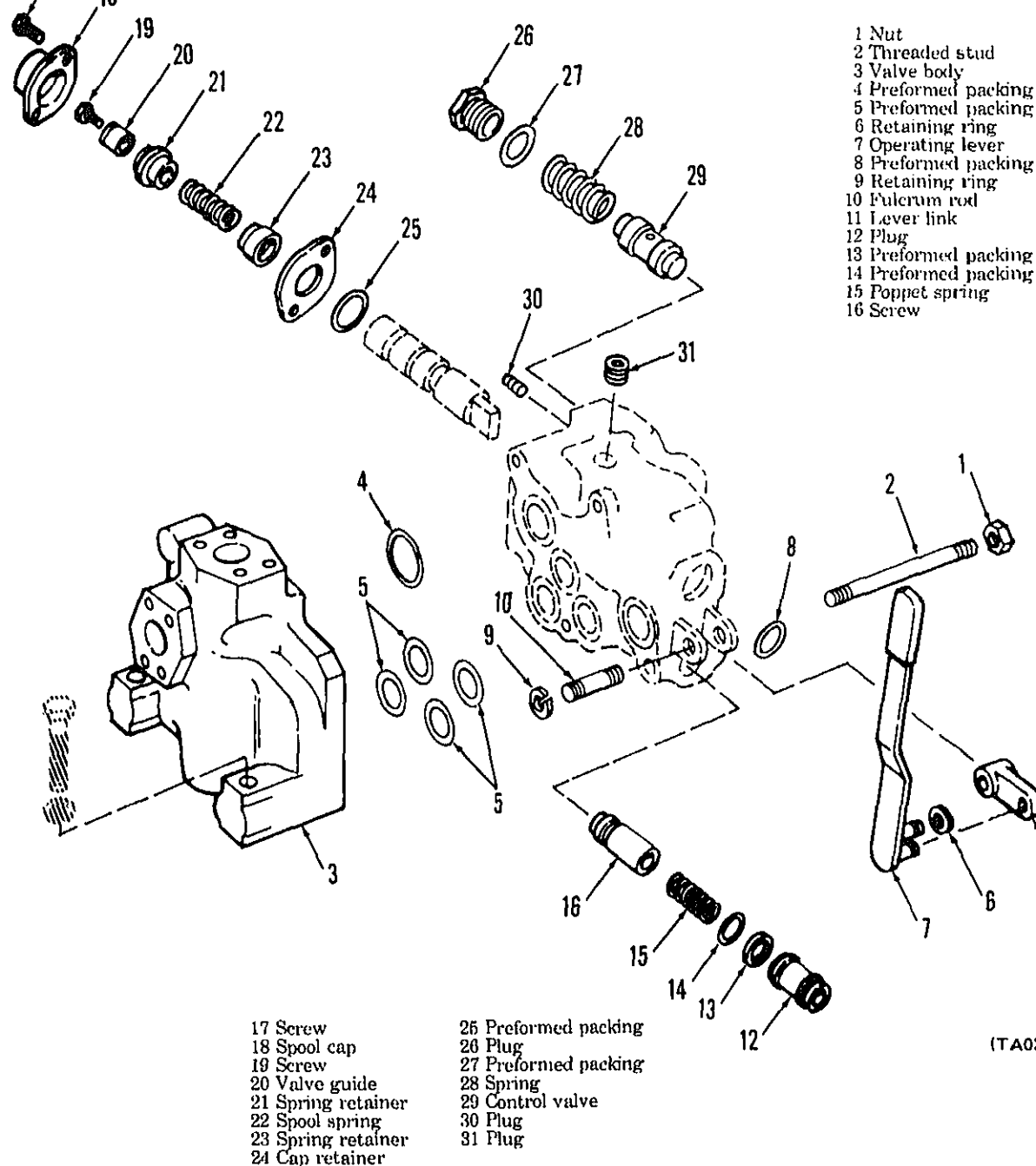


Figure 9-60, Utility blade control valve - exploded view.

(2) Remove mounting hardware and lift control valve from vehicle.

(3) Remove nuts (1), threaded studs (2) from

retaining ring (6). Remove and discard preformed packing (8).

(6) Remove plug (12), preformed packing

b. Cleaning, Inspection and Repair.

(1) Clean all metallic parts of the control valve with cleaning solvent (Fed. Spec. P-D-680, or equivalent) and dry thoroughly.

(2) Inspect valve parts for cracks, breaks, stripped threads, corrosion or other damage.

(3) Replace all preformed packing and damaged or defective parts.

c. Reassembly and Installation.

(1) Install plugs (30 and 31). Install control valve (29), spring (28) and new preformed packing (27). Secure with plug (26).

(2) Install new packing (25) and cap retainer (24). Install spring retainer (23), spring (22), spring retainer (21), and valve guide (20). Secure with screw (19).

(3) Install spool cap (18) and secure with screws (17).

(5) Assemble operating lever

(11) with retaining ring (6).

(6) Assemble lever link (11) with fulcrum rod (10) and securing rings (9).

(7) Install new preformed packing (25) in valve body (3) and connect valve body to actuator. Secure with threaded studs (2).

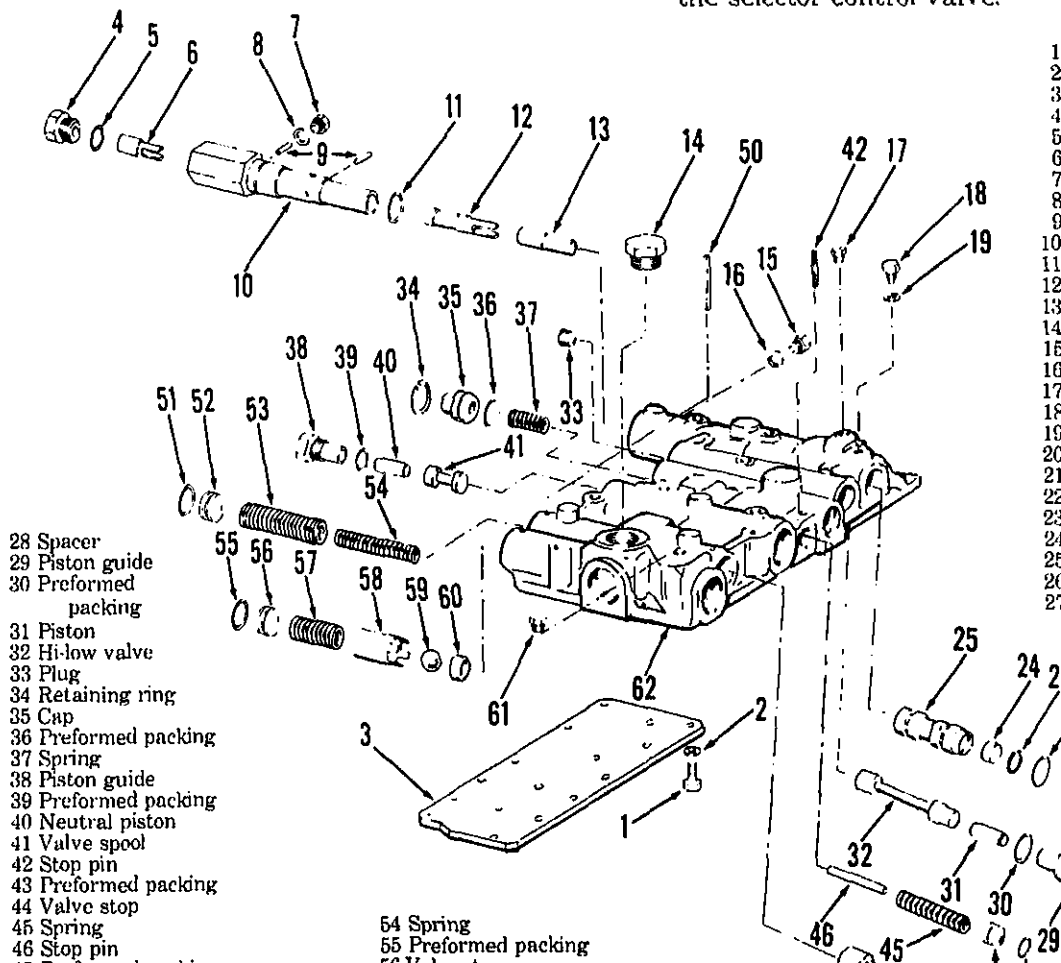
(8) Mount valve assembly on actuator attaching hardware.

(9) Uncap and connect all lines previously connected in removal procedure.

9-83. Selector Control Valve

a. Removal and Disassembly
(1) Disconnect selector valve 9-61 and remove and disassemble selector valve as follows:

(1) Disconnect and cap all lines connected to the selector control valve.



Remove selector valve (1), plug (6) and springs (2) and remove plate (3) from control valve cover.

Remove plug (4), preformed packing (5) and valve stop (6). Discard packing.

Remove plug (7) and washer (8). Remove valve stop (9) from housing (10) and remove housing (10) and valve cover (62).

Remove preformed packing (11), second speed valve (12) and first speed valve (13).

Remove plugs (14 and 15) and washer (16). Remove plugs (17 and 18) and washer (19).

Remove plug (20) and spring (21). Remove and discard preformed packing (22) from plug (20).

Remove selector valve (25). Remove retaining ring (23) and plug (24) from selector valve.

Remove union (26) from valve cover. Remove retaining ring (27), spacer (28) and piston guide (38).

Remove and discard preformed packing (39).

Remove piston (31) and hi-low valve (32) from valve cover (62). Remove plug (33).

Remove retaining ring (34), cap (35) and union (26). Remove and discard preformed packing (39).

Remove piston guide (38), neutral piston guide (39), valve spool (41). Remove and discard preformed packing (39).

Remove stop pin (42). Remove valve stop (43) and stop pin (46). Remove and discard preformed packing (43).

Remove valve stop (48) and valve spool (49). Remove and discard preformed packing (47).

Remove stop pins (50) and remove valve stop (51) and springs (53 and 54). Remove and discard preformed packing (51).

Remove valve stop (56), spring (57), spacer (58), valve ball (59), and safety valve seat (60). Remove and discard preformed packing (55).

Remove plug (61) from valve cover (62).

Cleaning, Inspection and Repair.

Clean all metallic parts of the selector control valve with cleaning solvent (Fed. Spec. 913-10-1 equivalent) and dry thoroughly.

Inspect for cracks, breaks, stripped threads, corrosion or other defects.

Replace all preformed packing and damaged or defective parts.

Install spring (57) and valve stop (51) in place with stop pin (50).

(4) Install new preformed packing (51) on valve stop (52) and install springs (54 and 53) and valve stop (51) in valve cover (62). Secure with stop pin (50).

(5) Install new preformed packing (47) on valve stop (48) and install valve spool (49) and valve stop in valve cover. Secure with stop pin (42).

(6) Install new preformed packing (43) on valve stop (44) and install stop pin (46), spring (45) and valve stop (44). Secure with stop pin (42).

(7) Install valve spool (41), neutral piston (42) and new preformed packing (39). Secure with piston guide (38).

(8) Install new preformed packing (36) on cap (35) and install spring (37) and cap (35). Secure with retaining ring (34).

(9) Install plug (33). Install hi-low valve (32) and piston (31). Place new preformed packing (39) on piston guide (29) and install guide (29) and spacer (28). Secure with retaining ring (27). Install union (26) in piston guide (29).

(10) Install selector valve (25) and plug (24). Secure with retaining ring (23).

(11) Install new preformed packing (22) on plug (20) and install spring (21) and plug (20) in valve cover (62).

(12) Install washer (19) and plugs (18 and 15) in valve cover.

(13) Install washer (16) and plugs (15 and 18) in valve cover.

(14) Install new preformed packing (11) on second speed valve (12) and install first speed valve (13) and second speed valve (12).

(15) Install stop pins (9), washer (8) and plug (7) into housing (10). Install housing (10) into valve cover.

(16) Install third speed valve (6), new preformed packing (5) and plug (4).

(17) Place plate (3) on valve cover (62) and secure with lockwashers (2) and screws (1).

(18) Place selector valve assembly in proper position on vehicle and secure with attaching hardware.

(19) Remove caps and connect all hydraulic lines disconnected in the removal procedure.

9-84. Outrigger Cylinder

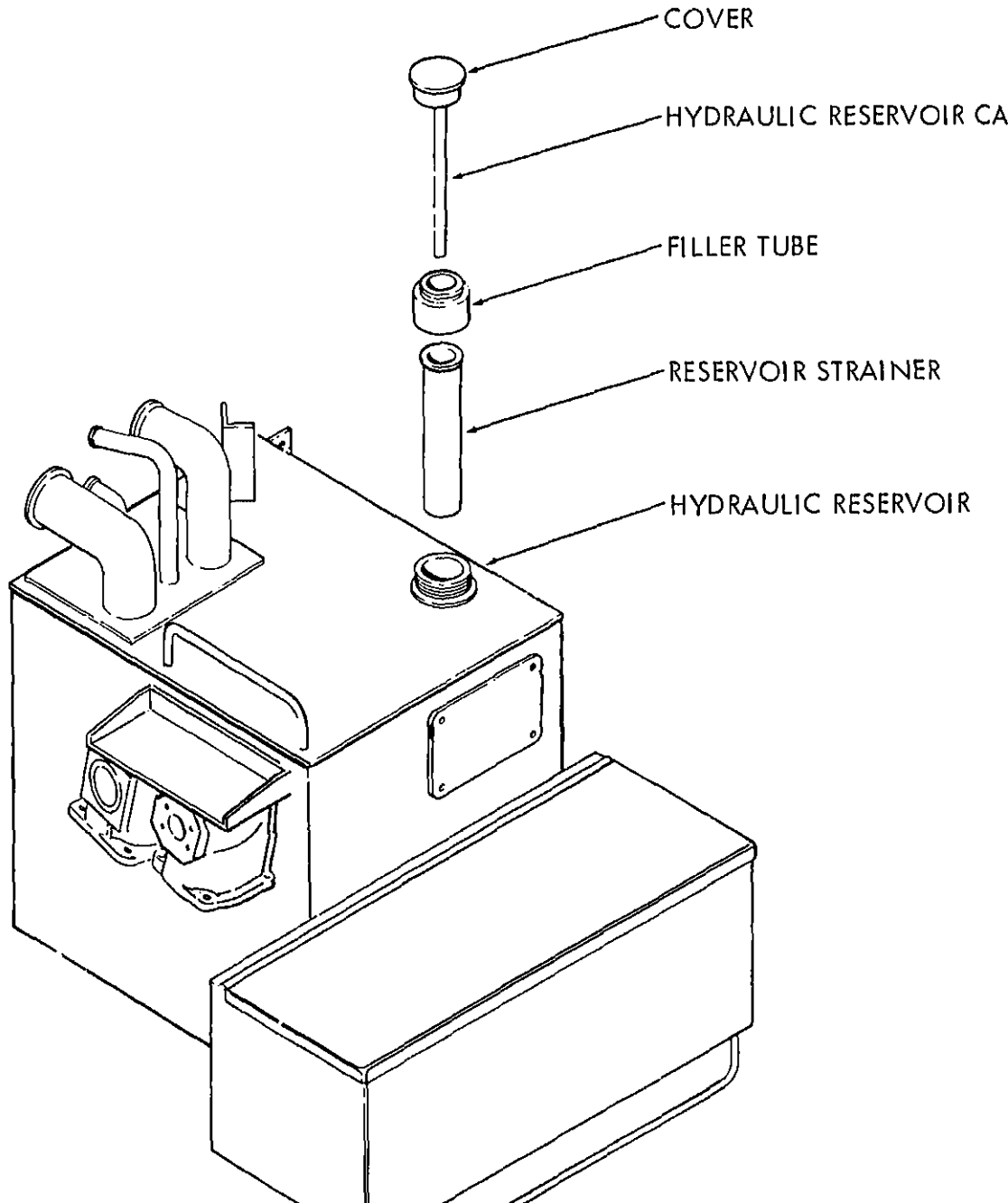
e. *Installation.* Refer to figure 9-62 and install outrigger cylinders as illustrated.

9-85. Hydraulic Reservoir Cap and Strainer.

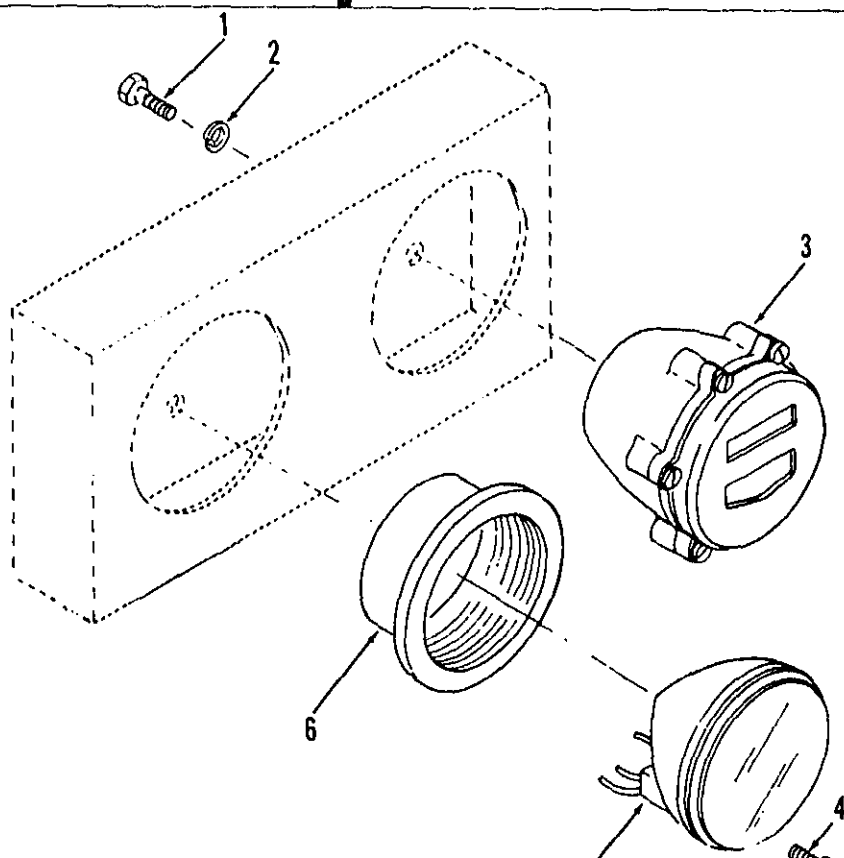
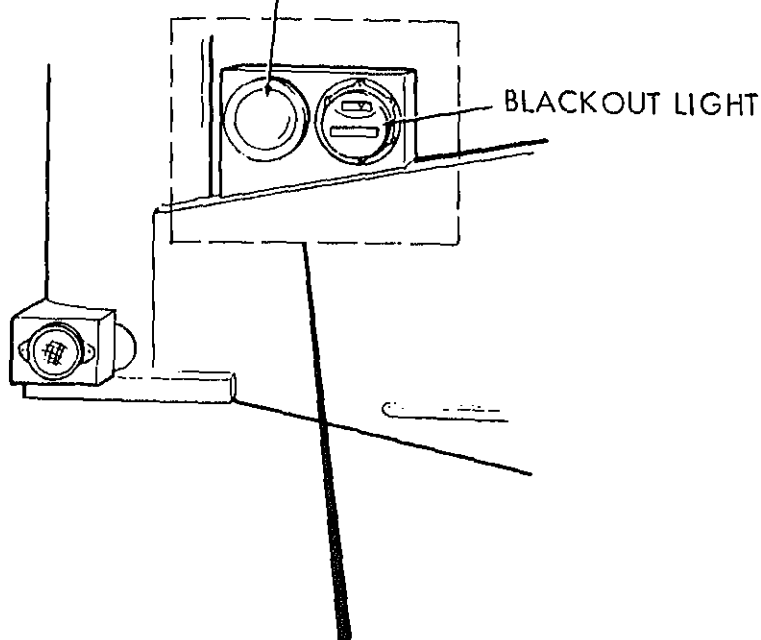
a. *Removal.* Refer to figure 9-63 and remove the hydraulic reservoir cap and screen as illustrated.

thoroughly.
(2) Inspect cap and strainer for defects and replace a defective cap or strainer.

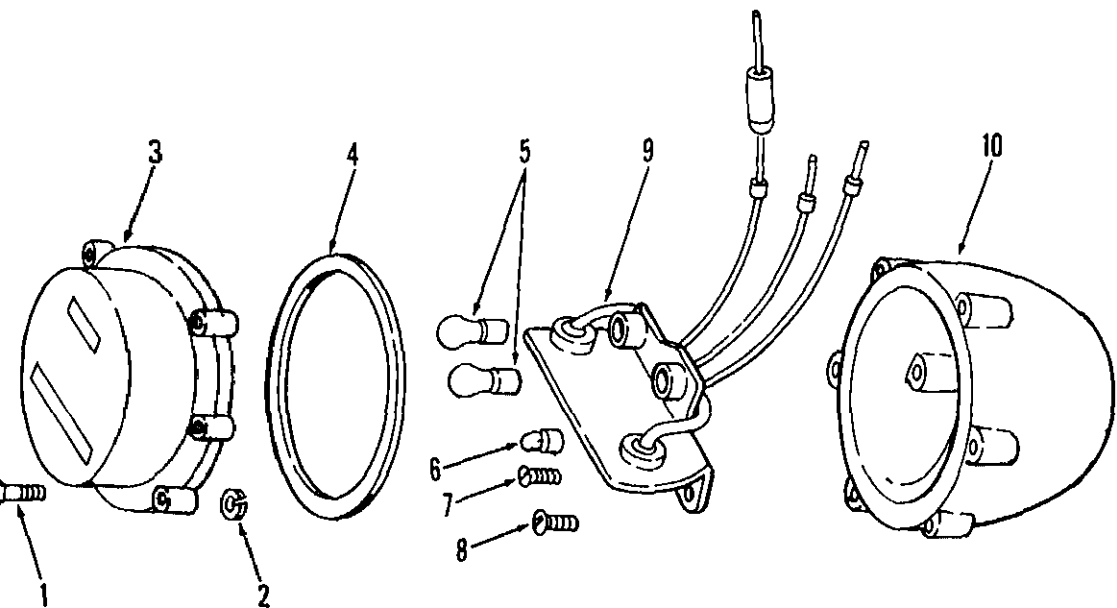
c. *Installation.* Refer to figure 9-62 and install reservoir cap and strainer as illustrated.



TAILLIGHT



- 1 Screw
- 2 Lock washer
- 3 Combination light
- 4 Screw
- 5 Red lamp
- 6 Lamp ring



(TA033128)

1 Screw
2 Ring
3 Door
4 Gasket
5 Lamp

6 Lamp
7 Screw
8 Screw
9 Socket assembly
10 Body

Figure 9-64. Combination taillight - exploded view.

(2) Remove lamps (5 and 6) from socket assembly (9).

(3) Remove screws (7 and 8) and lift socket assembly (9) from body (10).

Replacement. Replace all gaskets and damaged or defective parts.

Reassembly. Refer to figure 9-64 and reassemble the combination taillight as follows:

(1) Place socket assembly (9) in body (10) and secure with screws (7 and 8).

(2) Install lamps (5 and 6) in socket assembly (9).

(3) Place gasket (4) and door (3) on body (10) and secure with rings (2) and screws (1).

Installation. Refer to figure 9-63 and install turn signal and combination taillight as follows:

(1) Place lamp ring (6) and red lamp (5) into mounting holes and secure with screws (4).

(2) Install combination light (3) and secure with screws (2) and screw (1).

(1) Remove clearance marker lights by removing screws (1), door (2), lens (3) and lamp. Remove nut (5), lock washer (6) and screw. Remove mounting plate (8) and gasket (9).

(2) Remove blackout marker lights by removing screws (10), door (11), lens (12) and lamp. Remove nuts (14), lock washer (15), screws (16) and lift mounting plate (17) and gasket (18) from carrier. Remove washer (19) and shell cover (20).

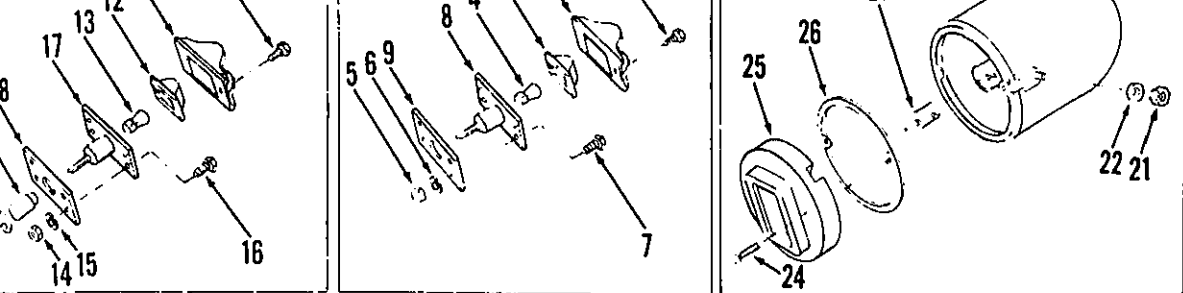
(3) Remove and disassemble the blackout marker assembly as follows:

(a) Remove nut (21) and lock washer (22) and lift assembly from carrier.

(b) Remove spacer (23). Remove screws (24) and lift door (25) and gasket (26) from body.

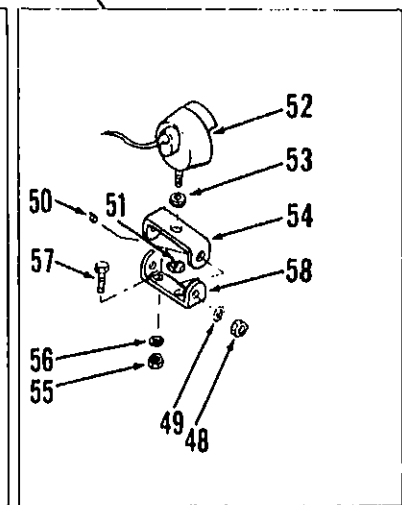
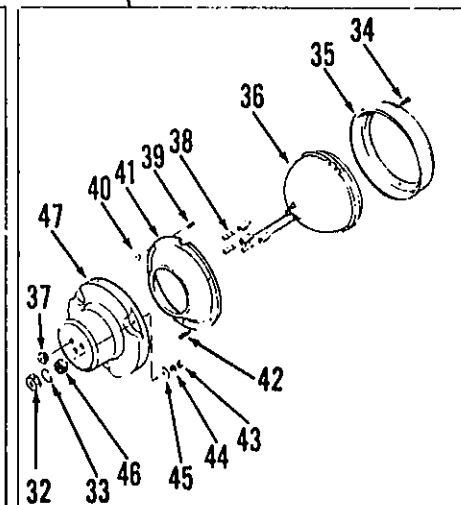
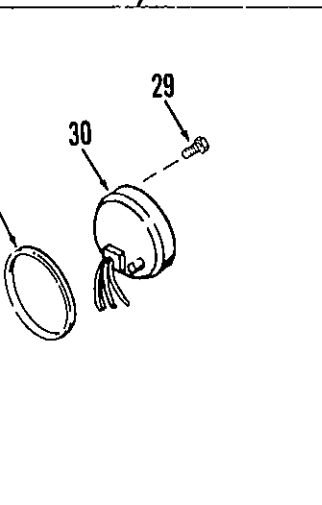
(c) Remove lamp (27).

(4) Remove turn signal by removing screws (29) and lifting lamp (30) and ring (31) from carrier.



Washer
Mounting plate

Washer
Mounting plate
Connector
Washer



24 Screw
25 Door
26 Gasket
27 Lamp
28 Body
29 Screw
30 Lamp
31 Ring

34 Screw
35 Ring
36 Seal beam
37 Grommet
38 Connector
39 Adjusting screw
40 Friction nut
41 Shield

44 Lock washer
45 Washer
46 Mounting shock
47 Housing
48 Nut
49 Lock washer
50 Screw
51 Nut

64 Bracket
65 Nut
66 Lock washer
67 Screw
68 Bracket

(TA03312)

(e) Remove nuts (43), lock washers (44), washers (45) and mounting shocks (46) from housing (47).

(6) Remove blackout light assembly as follows:

(a) Remove nut (48), lock washer (49) and screw (50) and blackout light and bracket from carrier.

(b) Remove nut (51) and lift blackout light from bracket (54). Remove lock washer (53).

(c) Remove nuts (55), lock washers (56) and screws (57) and remove bracket (58) from carrier.

Replacement. Replace all gaskets and damaged or defective parts.

Reassembly and Installation. Refer to figure 9-5 and reassemble and install the marker, blackout and headlights as follows:

(1) Install blackout light assembly as described in the following steps:

(a) Place bracket (58) on carrier and secure with screws (57), lock washers (56) and nuts (55).

(b) Place lock washer (53) on stud of blackout light (52). Install bracket (54) and secure with nut (51).

(c) Place bracket (54) over bracket (58) and secure with screw (50), lock washer (49) and nut (48).

(2) Assemble and install the headlight assembly as follows:

(a) Install mounting shocks (46) to housing (47), secure with washers (45), lock washers (44) and nuts (43).

(b) Connect springs (42) to shield (41) and install shield (41) to housing (47) using friction pins (40) and adjusting screws (39).

(c) Place connectors (38) in housing (47) and secure with grommets (37). Plug seal beam (36) into connectors and assemble seal beam (36) and grommets (37) to housing (47). Secure with screws (34).

(d) Install headlight assembly in light housing on carrier and secure with lock washers (33) and nuts (32).

(3) Install turn signal by assembling ring (31) and lamp (32) to light housing of the carrier. Secure with screws (29).

(4) Assemble and install the blackout marker assembly as follows:

(a) Install lamp (27) into socket of body (28).

(b) Assemble mounting plate assembly (16) to carrier and secure with screws (16), lock washers (15) and nuts (14).

(c) Install lamp (13) in socket of mounting plate (17).

(d) Assemble lens (12) and door (11) to mounting plate (17) and secure with screws (11).

(6) Install clearance marker lights to the carrier as follows:

(a) Assemble gasket (9) and mounting plate (8) to the carrier and secure with screws (7), lock washers (6) and nuts (5).

(b) Install lamp (4) in socket of mounting plate (8).

(c) Assemble lens (3) and door (2) to mounting plate and secure with screws (1).

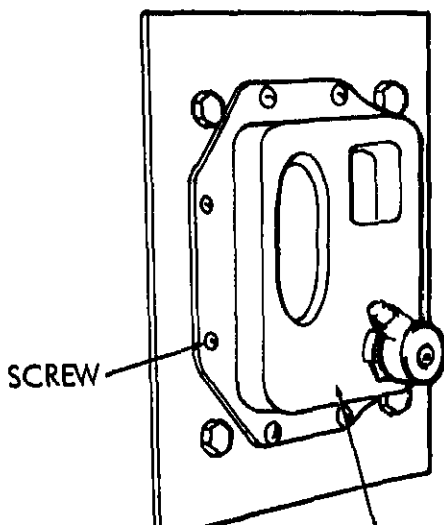
9-88. Dome Light

a. Removal. Refer to figure 9-66 and remove dome light as illustrated.

STEP 1. REMOVE MOUNTING SCREWS.

STEP 2. REMOVE DOME LIGHT ASSEMBLY.

STEP 3. TAG AND DISCONNECT ELECTRICAL LEADS.



assembly as shown.

Slave Light and Reel

ane trouble light repair, paragraph 4-45
trouble light as instructed.

Slave Receptacle

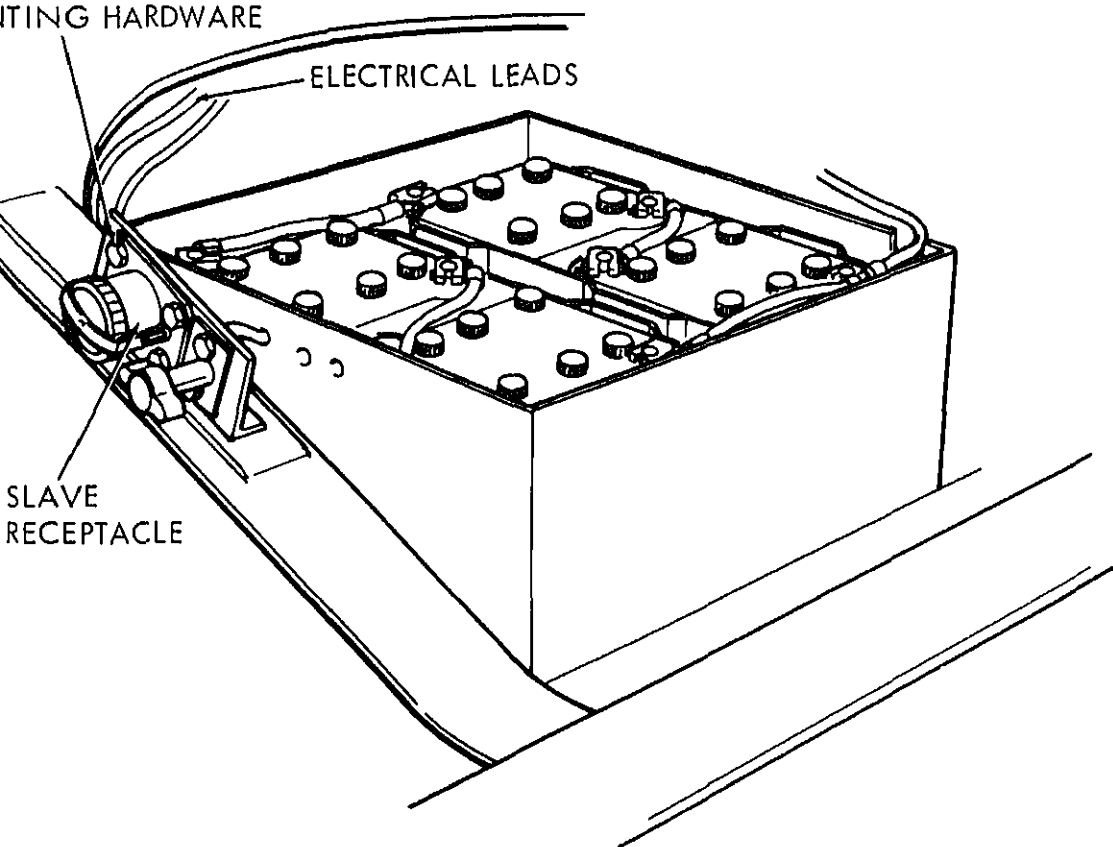
val. Refer to figure 9-67 and remove

- P 1. TAG AND DISCONNECT ELECTRICAL LEADS TO SLAVE RECEPTACLE.
- P 2. REMOVE MOUNTING HARDWARE AND REMOVE RECEPTACLE FROM CARRIER FRAME.

NTING HARDWARE

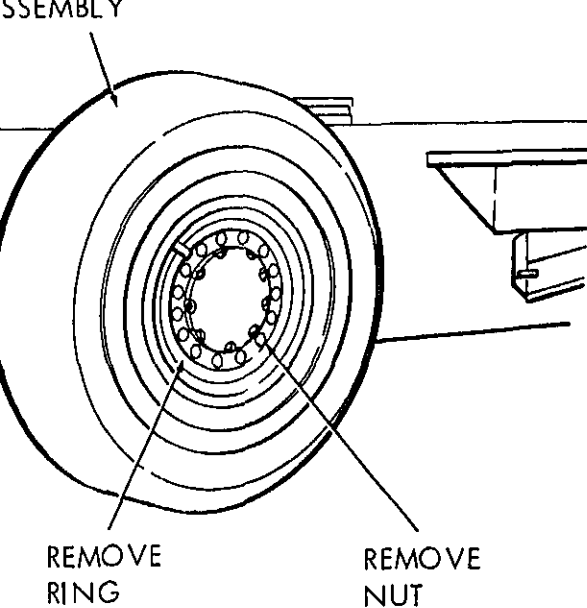
ELECTRICAL LEADS

SLAVE
RECEPTACLE



(TAO33131)

Figure 9-67. Slave receptacle, removal and installation.



NOTE: REMOVE OTHER WHEEL
AND TIRE ASSEMBLIES
IN A SIMILAR MANNER
(TA033132)

Figure 9-68. Tire and wheel assembly, removal and installation.

(1) Clean the rim assembly using the solvent (Fed. Spec. P-D-680, or equivalent) and thoroughly.

(2) Inspect wheel assembly for cracks, breaks, or other damage. Repair or replace damaged or defective parts.

c. *Installation.* Refer to figure 9-68 and the tire and wheel assembly as follows:

- (1) Install tire and wheel assembly on axle.
- (2) Install ring and mounting nuts.
- (3) Lower tire and wheel assembly by retracting outrigger.

9-93. Bearings and Seals Inspection

Remove wheel and tire assemblies as described in paragraph 9-42 and inspect bearings and seals for damage or defects. Report damaged or defective seals to direct support maintenance.

9-94. Hub Assembly Inspection

Inspect hub assembly for cracks, breaks, or other damage. Report a damaged hub assembly to direct support maintenance for repair or replacement.

APPENDIX A REFERENCES

Publication Indexes

ing indexes should be consulted frequently for latest changes or revisions and for new publications relating to material covered in this technical manual:

Publications

| | |
|--|--------------|
| Army Motion Pictures and Related Audio-Visual Aids | DA PAM 108-1 |
| Administrative Publications | DA PAM 310-1 |
| Blank Forms | DA PAM 310-2 |
| Docketing, Training, and Organizational Publications | DA PAM 310-3 |
| Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9) | DA PAM 310-4 |
| Supply Bulletins, and Lubrication Orders | DA PAM 310-4 |
| Publications Index of Supply Catalogs and Supply Manuals (types 7, 8, and 9) | DA PAM 310-6 |

Forms

DA Form 38-750, The Army Maintenance Management System (TAMMS) for instructions on the use of the forms pertaining to the material.

Technical Manuals, Supply Bulletins, Technical Bulletins, and Technical Manuals

| | |
|---|----------|
| and Maintenance of Ordnance Materiel in Cold Storage (0° to -65°F.) | TM 9-207 |
| Installation, Care and Maintenance of Antifriction Bearings | TM 9-214 |

Lubrication

| | |
|---|---------------------------|
| Steel Mounted, 20-Ton at 10-Foot Radius, 2 Engines, Diesel Engine | |
| 4 x 4 Air Transportable (Harneschfeger Model M320RT) | LO5-3810-295-12-1, -2, -3 |
| Lubricants, Oil, and Waxes | C 9100IL |

Tools

| | |
|----------------------------------|------------|
| Instructions for Field Use | TM 43-0139 |
|----------------------------------|------------|

Maintenance

| | |
|--|------------------|
| Installation, Care, Maintenance, and Repair of Pneumatic Tires and Tubes | TM 9-2610-200-20 |
| Antifreeze Solutions and Cleaning Compounds in Engine Cooling | TB 750-651 |
| Maintenance Management System (TAMMS) | TM 38-750 |
| and Organizational Maintenance Manual for Lead-Acid Storage Batteries | TM 9-6140-200-12 |
| Use of Cranes, Crane Shovels, Draglines and Similar Equipment | |
| Electric Power Lines | TB 385-101 |

formance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

Section III lists the tools and test equipment required for each maintenance function as referred from section II.

Maintenance Functions

Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing the characteristics with prescribed standards.

Service. Operations required periodically to place an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to lubricate, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

Adjust. To maintain, within prescribed limits, the operating characteristics to specified tolerances by bringing into proper or exact position, or by adjusting the operating characteristics to specified tolerances.

Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or measuring and diagnostic equipments used in precision measurement. Consists of comparisons of instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

Replace. The act of substituting a serviceable

sub-assembly, module (component or assembly) for an end item, or system.

j. Overhaul. That maintenance effort (services and actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMM) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those measurements (hours/miles, etc.) considered in classifying Army equipments/components.

B-3. Column Entries Used in the MAC

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, sub-assemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see para. B-2.)

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the functions listed in column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of tasks within the listed maintenance function vary at different maintenance levels, appropriate

ponent, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C Operator or crew.
O Organization maintenance.
F Direct support maintenance.
H General support maintenance.
D Depot maintenance.

e. *Column 5, Tools and Equipment.* Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

correlates with a maintenance identified end item or component.

b. *Column 2, Maintenance level of maintenance authorization of test equipment.*

c. *Column 3, Nomenclature.* Identification of the tool or test equipment.

d. *Column 4, National/NATO stock number.* National or NATO stock number of test equipment.

e. *Column 5, Tool Number.* Part number.

B-5. Explanation of Column

a. *Reference Code.* The code in column 1, section III.

b. *Remarks.* This column lists comments pertinent to the maintenance function as indicated on the MAC, section

Section II. ASSIGNMENT OF MAINTENANCE FUNCTION

| (1) | (2) | (3) | (4) | | | | |
|--------------|--|---|-------------------|-------------------|-------------------|---|----|
| Group number | Component/Assembly | Maintenance Function | Maintenance level | | | | |
| | | | C | O | F | H | |
| 01 | PART I - CRANE HOOK BLOCK Block Assembly, Hook | Inspect Service Replace Repair | 0.1 | 0.1 0.5 | 1.5 | | 2. |
| 02 | SPREADER ASSEMBLY | Service Replace Repair | | 0.1 1.6 2.8 | | | 4. |
| 03 | SAFE LOAD INDICATOR Safe Load Assembly | Test Calibrate Replace | | | 0.5 1.0 1.0 | | 2. |
| | Transducer | Test Replace | | | 0.5 1.0 | | 1. |
| | Load Cell Assembly | Test Replace | | | 0.5 1.0 | | 1. |

| Number | | Function | C | O | P | H | D | Equipment |
|--------|--|--------------------------------------|------------|---------------------|---|---|-----|-----------|
| 04 | ANGLE INDICATOR Indicator Assembly | Inspect Replace | 0.1 | 1.5 | | | | |
| 05 | BOOM Backstop Assembly | Inspect Replace Repair | 0.2 | 2.0 3.0 | | | 3.6 | |
| | Gantry Assembly | Inspect Replace Repair | 0.5 | 2.0 1.5 | | | 5.2 | |
| 06 | WINDSHIELD WIPER Wiper Assembly | Test Replace Repair | 0.1 | 1.0 1.5 | | | 4.0 | |
| 07 | LIGHTS Floodlight, Marker Lights (EA) | Test Inspect Replace Repair | 0.1 0.2 | 1.0 1.5 | | | 2.6 | |
| | Domelight Assembly | Replace Repair | | 0.5 0.5 | | | 1.8 | |
| | Troublelight Assembly | Test Inspect Replace Repair | 0.1 0.2 | 1.0 1.0 | | | 1.0 | |
| 08 | HORN Horn Assembly | Test Replace | 0.1 | 0.5 | | | 2.3 | |
| | | | | | | | 0.6 | |
| 09 | ENGINE COMPONENTS Compartment Assembly | Inspect Replace Repair | 0.2 | 5.0 2.0 | | | | 7.2 |
| 10 | CAB, CRANE Cab Assembly | Inspect Replace Repair | | 0.5 20.0 15.0 | | | | |
| 11 | CRANE HEATER, HOSES AND DUCTS Heater Hoses (All) | Inspect Replace Repair | 0.5 | 2.5 0.8 | | | | 35.5 |
| | Heater Assembly and Ducts | Inspect Replace Repair | 0.3 | 3.0 1.5 | | | | 3.8 |

| | | | | | | |
|----|---|---------|-----|-----|-----|-----|
| 14 | CRANE ENGINE RADIATOR Radiator | Service | 0.1 | | | |
| | | Test | | | | 0.1 |
| | | Replace | | | | 3.0 |
| | | Repair | | | | 4.0 |
| | Guard, and Related Parts (EA) Shroud | Inspect | 0.1 | | | |
| | | Replace | | 1.0 | | |
| | | Replace | | | 0.5 | |
| | | Repair | | | 0.5 | |
| 15 | CRANE EXHAUST SYSTEM Muffler and Pipes (All) | Inspect | 0.1 | | | |
| | | Replace | | 4.0 | | |
| 16 | WATER FILTER, CRANE ENGINE Water Filter, Hoses | Inspect | 0.1 | | | |
| | | Replace | | 0.5 | | |
| 17 | POLARITY RELAY Relays and Transmitters (EA) | Test | | 0.2 | | |
| | | Replace | | 0.5 | | |
| 18 | STARTING AID Starting Aid | Service | 0.2 | | | |
| | | Replace | | 0.8 | | |
| | Brackets and Tube (EA) | Inspect | 0.1 | | | |
| | | Replace | | 0.5 | | |
| 19 | AIR CLEANER Cleaner Assembly | Inspect | 0.1 | | | |
| | | Service | 0.2 | | | |
| | | Replace | | 1.0 | | |
| | | Repair | | 1.0 | | |
| 20 | FUEL PUMP, TANK AND FITTINGS Engine Fuel Hoses (EA) | Inspect | 0.2 | | | |
| | | Replace | | 0.8 | | |
| | | Repair | | 1.0 | | |
| | Pump Assembly, Primer | Inspect | 0.1 | | | |
| | | Replace | | 0.5 | | |
| | | Repair | | 0.5 | | |
| | Fuel Tank, Crane | Inspect | 0.2 | | | |
| | | Service | 0.2 | | | |
| | | Replace | | 1.5 | | |
| | | Repair | | 2.0 | | |
| 21 | BATTERIES Batteries | Inspect | 0.1 | | | |
| | | Test | | 0.2 | | |
| | | Service | 0.3 | | | |
| | | Replace | | 0.5 | | |

| | | | | | | | |
|----|---|---|----------------|-------------------|--------------|------|------|
| | | Replace | | 2.5 | | | 2.6 |
| 22 | CRANE THROTTLE AND RADIATOR SHUTTER CONTROL Throttle Assembly | Inspect Adjust Replace Repair | 0.2 | 0.3 2.0 1.5 | | | |
| | Cables, Control (EA) | Inspect Adjust Replace | 0.2 | 0.3 1.5 | | | 4.0 |
| 23 | INSTRUMENT PANEL Instrument Panel | Inspect Replace Repair | 0.1 | 4.0 3.0 | | | 2.0 |
| | Switches, Indicators (EA) | Inspect Replace | 0.1 | 0.5 | | | 7.1 |
| 24 | CRANE PROPELLER SHAFT AND CLUTCH Propeller Shaft | Inspect Replace Repair | 0.3 | 2.0 1.5 | | | 0.6 |
| 25 | ENGINE Engine | Inspect Test Service Replace Repair Overhaul | 0.5 0.5 | 3.0 25.0 | 16.0 31.0 | 36.0 | 96.0 |
| 26 | ENGINE ELECTRICAL GROUP Starter Assembly | Inspect Test Replace Repair | | 0.2 0.2 2.0 | 2.0 | | 4.4 |
| | Generator Mounting | Inspect Replace | 0.1 | 1.5 | | | 1.6 |
| | Generator Assembly | Inspect Test Replace Repair | 0.1 | 0.2 2.0 | 2.5 | | 4.8 |
| 27 | TACHOMETER Tachometer Assembly | Inspect Replace Repair | 0.1 | 1.5 0.5 | | | 2.1 |
| 28 | FILTER, STRAINER AND PUMP Filter Assembly, Fuel | Inspect Service Replace | 0.1 | 0.2 1.0 | | | |

| | | | | | | | |
|----|---|---------|-----|-----|-----|--|-----|
| 28 | FILTER, STRAINER AND PUMP - CONTINUED Strainer Assembly, Fuel | Inspect | 0.1 | | | | |
| | | Service | | 0.2 | | | |
| | | Replace | | 1.0 | | | 1.3 |
| | Pump Assembly, Fuel | Inspect | 0.1 | | | | |
| | | Replace | | 2.0 | | | 2.1 |
| 29 | BLOWER INSTALLATION Housing Assembly, Air Inlet | Inspect | 0.2 | | | | |
| | | Replace | | 3.0 | | | |
| | | Repair | | 1.5 | | | 4.7 |
| | Blower Assembly, Coupling and Drive | Inspect | | | 0.2 | | |
| | | Replace | | | 3.5 | | |
| | | Repair | | | 3.0 | | 6.7 |
| 30 | GOVERNOR AND CONTROLS Governor Assembly and Controls | Inspect | | | 0.5 | | |
| | | Adjust | | | 0.5 | | |
| | | Replace | | | 1.5 | | |
| | | Repair | | | 3.0 | | 5.5 |
| 31 | EXHAUST MANIFOLD Manifold | Inspect | | 0.1 | | | |
| | | Replace | | 3.0 | | | 3.1 |
| 32 | ENGINE LUBRICATION SYSTEM, CRANE Filter Assembly | Inspect | 0.1 | | | | |
| | | Service | | 0.5 | | | |
| | | Replace | | 1.0 | | | 1.6 |
| | Oil Pump and Front Cover | Inspect | | | 0.2 | | |
| | | Test | | | 0.3 | | |
| | | Replace | | | 2.0 | | |
| | | Repair | | | 3.0 | | 5.5 |
| | Breather, Oil Filter | Inspect | | 0.1 | | | |
| | | Service | | 0.2 | | | |
| | | Replace | | 1.0 | | | 1.3 |
| | Oil Cooler | Inspect | | 0.1 | | | |
| | | Replace | | 1.5 | | | |
| | | Repair | | 2.0 | | | 3.6 |
| | Oil Pan | Inspect | 0.2 | | | | |
| | | Replace | | | 2.5 | | 2.7 |
| | Inlet Screen and Pipes | Inspect | | | 0.2 | | |
| | | Service | | | 0.3 | | |
| | | Replace | | | 0.5 | | 1.0 |

| | | | | | | |
|----|----------------------------------|--|------------|------------|--------------------------|------|
| 34 | Thermostat | Inspect Replace | 0.2 1.0 | | | 1.1 |
| | Housing and Related Parts | Inspect Replace | 0.2 1.5 | | | 1.7 |
| | Pump Water, Pump Idler | Inspect Replace Repair | 0.2 | | 2.5 3.5 | 6.2 |
| | ENGINE, DIESEL AND RELATED PARTS | | | | | |
| | Cover, Rocker Arm | Inspect Replace | 0.1 | 0.8 | | 0.9 |
| | Injector Lever and Tube (All) | Inspect Replace | | 0.1 0.7 | | 0.8 |
| | Injector Assembly, Fuel (All) | Test Calibrate Replace Repair | | | 1.5 2.5 2.0 3.0 | 9.0 |
| | Rocker Arm and Valve Mechanism | Inspect Adjust Replace Repair | 0.2 | | 0.5 4.0 5.0 | 9.7 |
| | Cylinder Head | Inspect Replace Repair Overhaul | 0.2 | | 4.0 2.0 8.0 | 14.2 |
| | Valves, Exhaust (All) | Inspect Replace Repair | | | 0.5 4.0 2.0 | 6.5 |
| | Flywheel | Inspect Replace Repair | | | 0.2 2.0 1.5 | 3.7 |
| | Piston and Rod Assembly (All) | Inspect Replace Repair | | | 1.0 8.0 10.0 | 19.0 |
| | Crankshaft | Inspect Replace Repair | | | 0.5 4.0 8.0 | 12.5 |
| | Idler Gear and Hub | Inspect Replace Repair | | | 0.1 1.0 0.5 | 1.6 |
| | Camshaft and Balance Shaft (EA) | Inspect Replace | | | 0.3 2.0 | 2.3 |
| | Crankcase | Inspect Replace Repair | 0.2 | | 40.0 16.0 | |

| Number | Function | h | h | h | h | h |
|--------|---|--|------------|-------------------|--------------------|----|
| 35 | CRANE LOCK Lock Assembly, Crane | Inspect Replace Repair | | | 0.2 2.0 1.5 | 3. |
| 36 | CATWALK ASSEMBLY Catwalk Assembly, Crane | Inspect Replace Repair | 0.1 | 3.0 1.0 | | 4. |
| 37 | HYDRAULIC SYSTEM, CRANE Reservoir, Swivel Joints, Tubes and Fittings (EA) | Inspect Replace | | 0.3 1.5 | | 1. |
| | Cylinder Assembly, Hydraulic | Service Replace Repair | | 0.2 1.5 2.0 | | 3 |
| 38 | CONTROLS AND LEVERS, CRANE Control and Lever Assemblies (EA) | Adjust Replace Repair | | 0.2 2.0 1.0 | | 3 |
| | Cylinder Assembly | Service Replace Repair | | 0.1 2.0 1.5 | | 3 |
| | Stand Assembly, Swing Brake Control | Adjust Replace Repair | | 0.3 3.0 3.5 | | 6 |
| | Lock Assembly | Inspect Replace Repair | | 0.3 3.5 2.0 | | 5 |
| 39 | GEAR AND CHAIN HOUSING Shaft Assemblies (EA) | Inspect Replace Repair | | | 0.2 8.0 10.0 | 1 |
| | Chains (EA) | Inspect Replace Repair | 0.5 | | 3.0 2.0 | 5 |
| | Housing, Chain | Inspect Replace | 0.2 | 3.5 | | 3 |
| 40 | CLUTCH, SHAFT AND BRAKE ASSEMBLIES Clutch Assembly, Hoist | Inspect Adjust Replace Repair | 0.5 0.5 | | 8.00 3.0 | 16 |
| | Brake Assemblies, Hoist | Adjust | 0.5 | | | |

| Number | Function | C | O | P | H | D | Equipment |
|--------|---|---|-----|-------------------|-------------|---------------------|-----------|
| 40 | CLUTCH, SHAFT, AND BRAKE ASSEMBLIES - CONTINUED | | | | | | |
| | Shaft Assembly, Hoist | Inspect Service Replace Repair | 0.2 | | | 1.0 10.5 15.0 | 26.7 |
| | Clutch Assembly, Digging | Inspect Adjust Replace Repair | 0.5 | 0.5 3.0 | 5.0 4.0 | | 13.0 |
| | Shaft Assembly, Digging | Inspect Service Replace Repair | 0.2 | | 12.0 | 1.0 16.0 | 29.2 |
| | Clutch Assembly, Left Swing, Right Swing and Reversing (EA) | Inspect Adjust Replace Repair | 0.2 | 0.5 3.0 | 5.0 4.0 | | 12.7 |
| | Brake Assembly, Swing | Inspect Adjust Replace Repair | 0.2 | 0.5 4.0 | 10.0 1.0 | 3.0 | 18.7 |
| | Shaft Assembly, Reversing | Inspect Service Replace Repair | 0.2 | | 0.5 | 12.0 15.0 | 27.7 |
| | Shaft Assembly, Swing, Horizontal | Inspect Replace Repair | | | | 1.0 10.0 12.0 | 23.0 |
| | Shaft Assembly, Vertical Swing | Inspect Replace Repair | | | | 1.0 12.0 15.0 | 28.0 |
| | Lock Assembly, Swing | Inspect Replace Repair | 0.2 | 4.5 | 4.0 | | 8.7 |
| 41 | BOOM HOIST | | | | | | |
| | Clutch Assembly, Boom Hoist | Inspect Adjust Replace Repair | 0.5 | 0.5 7.0 4.0 | 3.0 | | 15.0 |
| | Brake Assembly, Boom Hoist | Inspect Adjust Replace Repair | 0.3 | 0.5 2.5 3.0 | 3.0 | | |

| | | | | | | | |
|----|--|---|-----|------------|------------|--------------------|------|
| 41 | BOOM HOIST - CONTINUED | | | | | | |
| | Pawl Assembly, Boom Hoist | Inspect Adjust Replace Repair | 0.2 | 0.5 2.0 | 8.0 7.0 | | 17.7 |
| | Shaft Assembly, Worm | Inspect Replace Repair | | | | 1.0 12.0 5.0 | 18.0 |
| 42 | REVOLVING FRAME | | | | | | |
| | Frame Assembly, Revolving | Inspect Replace Repair | | | | 1.0 15.0 5.0 | 21.0 |
| | Circle Assembly, Roller | Inspect Service Replace Repair | 0.2 | | | 1.0 5.0 8.0 | 14.2 |
| | Hook Roller (EA) | Inspect Adjust Replace | | 0.5 | 0.8 1.0 | | 2.3 |
| | Instruction Plates and Tool Box | Inspect Replace | 0.5 | 5.0 | | | 5.5 |
| | Platform Assembly | Inspect Replace | 0.2 | | 5.0 | | 5.2 |
| 43 | PART II - CARRIER ELECTRICAL WIRING SYSTEM, CARRIER | | | | | | |
| | Wiring Assemblies, Taillight (EA) | Inspect Replace Repair | 0.1 | 1.0 0.5 | | | 1.6 |
| | Harness, Wiring, Traller, Cab and Directional Signal | Inspect Replace Repair | 0.5 | | 5.0 2.0 | | 7.5 |
| | Harness, Wiring, Light Switch | Inspect Replace Repair | 0.2 | 2.0 1.0 | | | 3.2 |
| | Harness, Wiring Stop Light and Dimmer Switch (EA) | Inspect Replace Repair | 0.3 | 2.0 | 5.0 | | 7.3 |
| | Leads, Electrical (EA) | Inspect Replace | 0.1 | 0.5 | | | 0.6 |
| | Harness, Wiring, Torque Converter and Engine | Inspect Replace | 0.5 | | 2.0 1.0 | | |

| | | | | | | |
|---|---|------------------------------|-----|-------------------|------------|------------|
| | Replay, Alternator | Test Replace | | 0.5 0.5 | | |
| | Leads, Electrical, Alternator Battery (EA) | Inspect Replace Repair | 0.2 | | 0.5 0.2 | 1.0 |
| | Case, Assembly, Battery | Replace Repair | | 2.0 0.5 | | 0.9 |
| | Battery, Dry Storage (EA) | Test Service Replace | | 0.2 0.2 0.5 | | 2.5 0.9 |
| 4 | LIGHT ASSEMBLIES, AND MIRROR ASSEMBLY | | | | | |
| | Light Assemblies, Head, Tail, Marker, Blackout and Clearance (EA) | Inspect Replace Repair | 0.1 | 0.5 0.3 | | 0.9 |
| | Mirror Assembly | Inspect Replace Repair | 0.1 | 0.5 0.2 | | 0.8 |
| 5 | UTILITY BLADE AND HYDRAULIC BLADE CYLINDER ASSEMBLY | | | | | |
| | Blade, Utility | Inspect Replace Repair | 0.2 | | 2.0 | 7.2 |
| | Cylinder Assembly, Hydraulic | Inspect Replace Repair | 0.1 | | 1.5 4.0 | 5.6 |
| 6 | OUTRIGGERS AND RELATED PARTS | | | | | |
| | Outrigger, Front and Rear (EA) | Inspect Replace Repair | 0.1 | | 2.0 5.0 | 9.1 |
| | Cylinder, Hydraulic (EA) | Inspect Replace Repair | 0.1 | | 1.0 3.0 | 4.1 |
| | Pad Assembly (EA) | Inspect Replace Repair | 0.1 | | 0.6 0.5 | 0.2 |
| 7 | STEERING ASSEMBLY, FRONT: CARRIER | | | | | |
| | Button Assembly, Horn | Inspect Replace | 0.1 | 0.5 | | 0.6 |
| | Gear Box Assembly, Front (EA) | Service Adjust | 0.2 | | 1.5 | |

| | | | | | | | |
|----|---|--|-----|----|-------------------|-------------------|-----|
| 47 | STEERING ASSEMBLY, FRONT: CARRIER - CONTINUED | | | | | | |
| | Valve Assembly (EA) | Inspect Replace Repair | | 01 | 2.0 4.0 | | 6.1 |
| | Gear Assembly, Worn | Service Adjust Replace Repair | 0.2 | | 1.0 2.0 3.0 | | 6.2 |
| 48 | WINDSHIELD WIPER, PRESSURE INDICATOR, HORN, LINES, VALVES | | | | | | |
| | Wiper Assembly, Windshield | Test Replace Repair | 0.1 | | 1.0 1.0 | | 2.1 |
| | Indicator, Air | Replace Repair | | | 0.3 0.3 | | 0.6 |
| | Valve Assembly, Brake Actuating | Replace Repair | | | 0.5 1.0 | | 1.5 |
| | Valve, Check, Double | Replace Repair | | | 0.3 0.5 | | 0.8 |
| 49 | VALVE ASSEMBLIES, RESERVOIR EXHAUST HOSE AND TUBES ASSEMBLIES | | | | | | |
| | Hose and Tube Assemblies (EA) | Inspect Repair | 0.1 | | 0.9 | | 1.0 |
| | Valve, Drain and Control (EA) | Replace Repair | | | 0.5 0.5 | | 1.0 |
| | Valve Assembly, Control Reservoir Exhaust | Replace Repair | | | 0.6 | 0.5 | 1.1 |
| 50 | GOVERNOR, EVAPORATOR, VALVES, HOSE AND TUBE ASSEMBLIES | | | | | | |
| | Governor Assembly, Air Compressor | Inspect Repair | 0.1 | | 0.6 | 0.2 0.3 0.5 | 0.7 |
| | Evaporator Assembly, Alcohol | Adjust Replace Repair | | | | | 1.0 |
| | Valve, Check (EA) | Inspect Replace Repair | 0.1 | | 0.5 0.5 | | 1.1 |
| | | | | | 0.3 | | 0.4 |

| | | | | | | |
|----|---|------------------------------|-------------------|-----|-----|-----|
| 52 | Tube Assemblies (EA) | Inspect Repair | 0.2 1.0 | 0.4 | 2.5 | 1.2 |
| | Valve Assembly, Drain | Inspect Replace Repair | 0.1 0.6 0.3 | | | |
| | AIR BRAKE TUBE AND VALVE ASSEMBLIES | | | | | |
| | Tube Assemblies (EA) | Inspect Replace Repair | 0.2 1.5 1.0 | | | |
| 52 | AIR BRAKE TUBE AND VALVE ASSEMBLIES | | | 0.4 | 2.5 | 2.7 |
| | Tube Assemblies (EA) | Inspect Replace Repair | 0.2 1.5 1.0 | | | |
| | Valve Assembly, Treadle | Test Replace Repair | 0.1 2.0 2.5 | | | |
| | Hose and Tube Assemblies (EA) | Inspect Replace Repair | 0.1 1.5 1.0 | | | |
| 53 | Valve Assembly, Pressure and Safety | Inspect Replace | 0.1 0.5 | 0.4 | 2.5 | 2.6 |
| | AIR BRAKE VALVE, CHAMBER, HOSE AND TUBE ASSEMBLIES, FRONT BRAKE | | | | | |
| | Hose and Tube Assemblies, Front and Rear (EA) | Inspect Replace Repair | 0.1 1.5 0.5 | | | |
| | Valve Assembly, 3 way | Inspect Replace Repair | 0.1 0.5 | | | |
| 53 | Valve Assembly, Control | Inspect Replace Repair | 0.1 0.5 0.5 | 0.4 | 2.5 | 1.0 |
| | Chamber Assembly, Air Brake (EA) | Replace Repair | 2.0 | | | |
| | Valve Assembly, Relay | Inspect Replace Repair | 0.1 0.5 1.0 | | | |
| | HYDRAULIC VALVE, HOSE AND TUBE ASSEMBLIES | | | | | |
| 54 | Valve Directional | Replace Repair | 0.8 | 1.0 | | 1.6 |
| | | | | | | |
| | | | | | | 1.8 |

| Group number | Component-Assembly | Maintenance Function | | | | | | Tools and equipment |
|--------------|--|------------------------------|-----|------------|------------|---|---|---------------------|
| | | | C | O | F | U | D | |
| 54 | HYDRAULIC VALVE HOSE AND TUBE ASSEMBLIES - CONTINUED | | | | | | | |
| | Hose and Tube Assemblies (EA) | Replace Repair | | 1.5 0.5 | | | | 2.0 |
| | Valves, Selector and Flow Control (EA) | Replace Repair | | | 0.5 1.0 | | | 1.5 |
| 55 | HYDRAULIC VALVE, HOSE AND TUBE ASSEMBLIES, STEERING | | | | | | | |
| | Hose and Tube Assemblies | Inspect Replace Repair | 0.1 | 1.0 0.8 | | | | 1.9 |
| | Cylinder Assembly, Lockout and Steering (EA) | Replace Repair | | 0.8 | 2.0 | | | 2.8 |
| | Valve Assembly, Solenoid | Replace Repair | | 1.0 | 1.5 | | | 2.5 |
| | Valve assembly, Check-Relief | Replace Repair | | 1.0 1.5 | | | | 2.5 |
| 56 | HYDRAULIC CYLINDER, VALVES HOSE AND TUBE ASSEMBLIES, DOZER | | | | | | | |
| | Hose and Tube Assemblies, Dozer Cylinder (EA) | Replace Repair | | 0.8 1.0 | | | | 1.8 |
| | Valve Assembly, Flow Divider | Replace Repair | | 0.5 1.0 | | | | 1.5 |
| | Valve, Dozer Control | Replace Repair | | 1.0 | 2.5 | | | 3.5 |
| | Hose and Tube Assemblies (EA) | Replace Repair | | 0.8 1.0 | | | | 1.8 |
| | Valve, Check | Replace Repair | | 0.3 0.3 | | | | 0.6 |
| | Valve, Assembly, Pilot | Replace Repair | | 0.5 2.0 | | | | 2.5 |
| | | | | | | | | |
| 57 | HYDRAULIC COMPONENTS | | | | | | | |
| | Hose and Tube Assemblies, Steering (EA) | Replace Repair | | 0.8 1.0 | | | | 1.8 |
| | Valve Assembly, Control, Angle and Relief (EA) | Replace Repair | | 0.4 0.5 | | | | 0.9 |
| | Valve Assembly, Fan Control, Hand and Pilot (EA) | Replace Repair | | | 0.8 0.5 | | | 1.3 |

TUBE ASSEMBLIES - CONTINUED

| | | | | | | |
|---|---|---|------------|-------------------|------------|------------|
| | Valve, Pilot | Replace Repair | | 1.0 1.5 | | |
| | Filter Assemblies (EA) | Service Replace Repair | | 0.5 1.0 0.5 | | 2.5 |
| | Tank Assembly, Hydraulic | Inspect Replace Repair | 0.1 | | 2.0 1.5 | 2.0 4.6 |
| 9 | COOLING SYSTEM, ENGINE Radiator Assembly | Inspect Test Service Replace Repair | 0.1 0.2 | | 0.5 2.0 | 4.0 |
| | Motor, Hydraulic, Hoses | Inspect Replace Repair | 0.2 | | 1.5 2.0 | 6.8 3.7 |
| | Oil Cooler, Heat Exchanger, Fan and Hoses (EA) | Inspect Replace | 0.2 | | 0.8 | 1.0 |
| 0 | FUEL SYSTEM Hose and Tube Assemblies (EA) | Inspect Replace Repair | 0.1 | | 1.0 1.0 | 2.1 |
| | Tank Assembly | Inspect Service Replace Repair | 0.2 0.3 | | 2.0 0.2 | 2.7 |
| 1 | AIR CLEANER Air Cleaner Assembly | Inspect Service Replace Repair | 0.1 0.2 | | 1.5 0.7 | 2.5 |
| 2 | EXHAUST SYSTEM Muffler and Mounting Parts | Inspect Replace | 0.1 | | 2.0 | 2.1 |
| 3 | PROPELLER SHAFTS Shaft Assembly (EA) | Inspect Service Replace Repair | 0.1 0.2 | | 2.5 3.0 | 5.8 |
| 4 | TORQUE CONVERTER AND RELATED PARTS Converter Assembly | Service Replace Repair | | 0.2 | 8.0 | 16.0 |

| | | | | | | |
|----|---|---|-----|--------------------------|--------------|------|
| 65 | Valve Assembly, Regulating PUMPS, HYDRAULIC Pump Assemblies (EA) | Inspect Replace Repair | 0.2 | | 1.5 1.0 | 2.7 |
| | | Inspect Replace Repair | 0.2 | 2.0 2.5 | | |
| 66 | TRANSMISSION ASSEMBLY, MOUNTING AND CONNECTIONS Transmission Assembly | Service Replace Repair | 0.2 | | 5.0 20.0 | 4.7 |
| | | Inspect Replace Repair | 0.2 | | 2.0 2.5 | 25.2 |
| 67 | ENGINE ELECTRICAL COMPONENTS Starter, Engine | Inspect Test Replace Repair | 0.2 | 0.2 0.2 1.5 1.9 | 3.8 | 4.7 |
| | | Inspect Test Replace Repair | 0.2 | 0.2 2.0 3.5 | 2.5 | 5.7 |
| 68 | ENGINE Engine Assembly | Inspect Test Service Replace Repair Overhaul | 0.3 | 2.5 2.0 | 12.0 38.0 | 6.4 |
| | | Service Replace Repair | | 12.0 0.5 2.0 | 52.0 1.5 | 18.8 |
| | Cooler, Oil | Inspect Replace | 0.2 | | 2.5 | 4.0 |
| | | Test Replace | | 1.5 2.0 | | 2.7 |
| | Manifold, Intake and Exhaust (EA) | Replace Repair | | 2.0 3.0 | | 3.5 |
| | | Test Replace Repair | | 1.0 3.0 8.0 | | 5.0 |
| | Thermostats (EA) | Replace Repair | | 1.5 1.5 | | 12.0 |
| | | Test | | 0.5 | | 3.0 |
| | Pump Assembly, Water | Replace Repair | | | | |
| | | Test Replace Repair | | | | |
| | Valve, Shutdown | Replace Repair | | | | |
| | | Test | | | | |
| | Compressor Assembly, Air | Test | | | | |
| | | | | | | |

| Component/Assembly | Function | C | O | F | H | D | equipment |
|--|--|-----|-------------------|------------|-------------------|------|-----------|
| ENGINE - CONTINUED | | | | | | | |
| Levers, Push Rods and Tappets (All) | Adjust Replace Repair | | | 1.5 | 4.0 5.0 | 10.5 | |
| Injector Assemblies (All) | Test Calibrate Replace Repair | | | 2.5 | 2.0 1.5 4.0 | 10.0 | |
| Head Assembly | Replace Repair Overhaul | | | | 4.0 3.0 8.0 | 15.0 | |
| Flywheel | Replace Repair | | | | 8.0 2.0 | 10.0 | |
| Pan, Oil | Replace Repair | | | 4.0 1.5 | | 5.5 | |
| Camshaft | Replace Repair | | | | 5.0 1.5 | 6.5 | |
| Piston Assembly and Connecting Rods (All) | Replace Repair | | | | 12.0 6.0 | 18.0 | |
| Crankshaft Assembly | Replace Repair | | | | 5.0 10.0 | 15.0 | |
| Crankcase Assembly | Replace Repair | | | | 48.0 10.0 | 58.0 | |
| Filter Assemblies (EA) | Service Replace Repair | | 0.5 2.0 1.0 | | | 3.5 | |
| STEERING | | | | | | | |
| Hose Assemblies, Hys (EA) | Inspect Replace | 0.1 | 1.4 | | | 1.5 | |
| Cylinder Assemblies, Steering and Centering (EA) | Test Replace Repair | | 0.2 | | 3.0 4.0 | 7.2 | |
| AXLES, FRONT AND REAR | | | | | | | |
| Axle Assemblies, Front and Rear (EA) | Service Replace Repair Overhaul | | 0.2 2.5 | | 8.0 40.0 | 50.7 | |
| Differential and Carrier Assembly (EA) | Replace Repair | | | | 8.0 10.0 | | |

| | | | | | | |
|----|----------------------------------|---|------------|-------------------|--------------|------|
| | | Replace Repair | | | 5.0 5.2 | |
| | Wheel Assembly (EA) | Replace Repair | | 4.0 0.5 | | 10.4 |
| | | | | | | 4.5 |
| | Tires (EA) | Inspect Service Replace Repair | 0.2 0.1 | 2.5 1.5 | | |
| | Disconnect, Front Axle | Adjust Replace Repair | | 0.2 | 3.0 1.0 | 4.3 |
| 71 | CONTROLS | | | | | 4.2 |
| | Shift Assembly | Replace Repair | | | 2.5 4.0 | 6.5 |
| | Throttle Assembly | Adjust Replace Repair | | 0.5 3.0 3.5 | | 7.0 |
| 72 | CAB ASSEMBLY AND RELATED PARTS | | | | | |
| | Cab Assembly, Operators | Replace Repair | | | 18.0 16.0 | 44.0 |
| | Heater Assembly | Test Replace Repair | 0.2 | 2.5 2.7 | | 5.4 |
| | Seat Assembly | Replace Repair | | 2.0 5.0 | | 7.0 |
| | Light Assembly, Trouble | Test Replace Repair | 0.1 | 1.0 1.1 | | 2.2 |
| | Mirror Assembly | Replace Repair | | 0.8 1.0 | | 1.8 |
| | Board Assembly, Instrument Panel | Replace Repair | | 5.0 10.0 | | 15.0 |
| 73 | FRAME, CARRIER | | | | | |
| | Frame and Related Parts | Replace Repair | | | 42.0 6.0 | 48.0 |
| | Hook Assembly, Pintle | Service Replace Repair | | 0.1 0.5 1.6 | | 2.2 |

Portable Fire Fighting Equipment:
Fire Extinguisher (1 ea for Crane
and Carrier)

Inspect
Test
Replace

0.1

0.2
1.0

1.3

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

Special tool or test equipment is authorized for this vehicle.

Section I. INTRODUCTION

Scope

Appendix lists basic issue items and items installed or authorized required by crew/ for operation and required for the performance of organizational maintenance of the ft truck.

General

Basic Issue Items, Items Troop Installed or Authorized List is divided into the following sections:

Basic Issue Items List - Section II. A list, in alphabetical sequence, of items which are furnished with, and which must be turned in with, end item.

Items Troop Installed Or Authorized List - Section III. A list, in alphabetical sequence, of items which, at the discretion of the unit commander, may accompany the end item, but are subject to be turned in with the end item.

Explanation of Columns

Following provides an explanation of columns in the tabular listings.

Source, Maintenance, and Recoverability (SMR).

(1) Source code. Indicates the source for the items. Source codes are:

Explanation

Repair parts, supplied from the GSA/DSA or Army supply system and authorized for use at indicated maintenance categories.

Repair parts which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.

Assigned to items which are NSA design controlled: unique repair parts, which are stocked and supplied by the Army COMSEC Logistic System and which are not subject to the provisions of AR 380-41.

Repair parts which are not procured or stocked as such in the supply system but are to be manufactured at indicated maintenance levels.

Assemblies which are not procured or stocked as such but are made up of two or more units. Such component units carry individual stock numbers and descriptions,

Code

Explanation

- | | |
|----|---|
| | part or assembly should result in retirement of item from the supply system. |
| X1 | Repair parts which are not procured or stocked; requirement for such items will be filled by the higher assembly or component. |
| X2 | Repair parts which are not stocked and have no future mortality. The indicated maintenance category requiring such repair parts will attempt to obtain parts through cannibalization or salvage. They may be requisitioned, with exception data, from end item manager for immediate use. |
| G | Major assemblies that are procured with PEMA for initial issue only as exchange assemblies at GS level. These assemblies will not be stocked at DS and GS level or returned to depot supply. |

NOTE

Cannibalization or salvage may be used as a source of supply for any items sourced coded above except those coded X1.

(2) Maintenance code. Indicates the maintenance category of maintenance authorized to install listed item. Capabilities of higher maintenance categories are considered equal or better. Maintenance codes are:

Code

Explanation

- | | |
|---|----------------------------|
| C | Crew/Operator |
| O | Organizational maintenance |

(3) Recoverability code. Indicates whether serviceable items should be returned for recovery or salvage. Items not coded are nonrecoverable. Recoverability codes are:

Code

Explanation

- | | |
|---|---|
| R | Repair parts (assemblies and components) which are considered economically repairable at direct and support maintenance levels. When the item is no longer economically repairable, it is normally disposed of at the GS level. When supply considerations require, some of these repair parts may be listed for authorized return to supply for depot level repair as set forth in AR 710-1. When so listed, they will be replaced on an exchange basis. |
| S | Repair parts and assemblies which are economically repairable at DS and GS activities and which are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically repairable, they will be evacuated to a depot for repair and analysis before final disposition. |
| T | High dollar value recoverable repair parts which are subject to special handling and are issued on a special order. |

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

| (1) National stock number | (2) Description | (3) Unit of meas |
|--|--|---------------------------|
| 7510-00-889-3494 7620-00-559-9018 4210-00-889-2221 | Binder, Loose Leaf Case, Operation and Maintenance Manual Extinguisher, Fire | Ea Ea Ea |

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|--|--|
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| Control panel | |
| Cooling system: | |
| General | |
| Inspection | |
| Service | |
| Crane shutdown | |
| Cylinder, hydraulic (brake or clutch) | |
| Description: | |
| Carrier | |
| Crane | |
| General | |
| Dismantling for movement | |
| Dome light | |
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| Replacement | |
| Drive chains: | |
| Adjustment | |
| Repair | |
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| Ducts, heater | |
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n:
distributed in accordance with DA Form 12-25B, operator maintenance requirements for
Wheel Mounted.

★ U.S.GOVERNMENT PRINTING OFFICE : 1990 O - 261-872 (20687)



THEN... JOT DOWN THE
DOPE ABOUT IT ON THIS
FORM, TEAR IT OUT, FOLD
IT AND DROP IT IN THE
MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

PFC JOHN DOE
CoA, 3^d ENGINEER BN
FT. LEONARD WOOD MO 6310

DATE

16 DEC 74

PUBLICATION NUMBER

TM5-6115-200-20 AND P

DATE

1 APR 72

TITLE

GENERATOR SET 10 KV
NSN 6115-00-231-7286

BE EXACT... PIN-POINT WHERE IT IS

IN THIS SPACE TELL WHAT IS WRONG
AND WHAT SHOULD BE DONE ABOUT IT:

| PAGE NO. | PARA- GRAPH | FIGURE NO. | TABLE NO. |
|-------------|----------------|---------------|--------------|
|-------------|----------------|---------------|--------------|

6

2-1
a

In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.

81

4-3

Callout B on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.

125 line 20

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

JOHN DOE, PFC (268) 317-7111

SIGN HERE:

John Doe

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GRAPH

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NO.TABLE
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GRAPH

FIGURE
NO.

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NO.

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